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Post-War Plans

Although the war is far from won, a great deal is being said these days about post-war planning. Some 12 or 13 committees have been set up, under various auspices, to study the national economy and try to point the way to a continuation of prosperity when the war is done and the necessity for fighting materials will have ceased.

This is all to the good, but, as the National Small Business Men's Association points out, the effectiveness of the proposed plans will depend to a large extent upon the financial positions of the many firms who will be expected to make the plans effective. In other words, will they have working capital?

The government has been setting pretty tight limits in its renegotiation policy; in some cases, much too tight. Not that we advocate letting everyone get away with whatever they can, such as, for instance, giving a stenographer a $40,000 bonus, but every firm should be allowed to set up enough reserve so that it can reconvert to peacetime production and buy the necessary new equipment without having to borrow from the bank.

Next to tomorrow's battle, the thing that is uppermost in the minds of the boys "over there" is whether they will have jobs when they get back. And the minute an armistice is signed, that job will be the most important subject to everyone. Whether those jobs will be available will depend not only upon having good plans, but upon having the money to put them into operation.

The government should not overlook the fact that a prosperous peace can only be ensured by having a prosperous industry, and failure in peace will be letting America down unnecessarily.

(Courtesy of MODERN MACHINE SHOP)

Synchronizing Ovens With Spray Booths

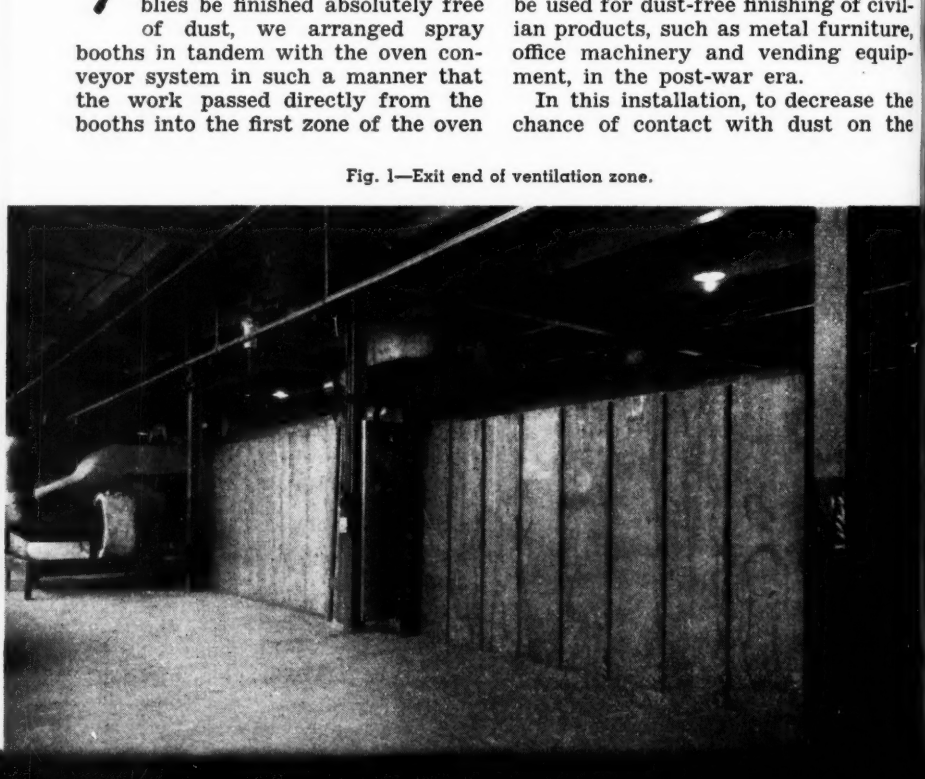
Four-zone conveyor oven has ventilation zone for dust-free operation on ordnance materials

By C. A. LITZLER
Chief Engineer
The Industrial Oven Engineering Co., Cleveland, Ohio

IN an installation where it was imperative that ordnance assemblies be finished absolutely free of dust, we arranged spray booths in tandem with the oven conveyor system in such a manner that the work passed directly from the booths into the first zone of the oven system without exposure to dust-laden air. The same method can, of course, be used for dust-free finishing of civilian products, such as metal furniture, office machinery and vending equipment, in the post-war era.

In this installation, to decrease the chance of contact with dust on the

Fig. 1—Exit end of ventilation zone.



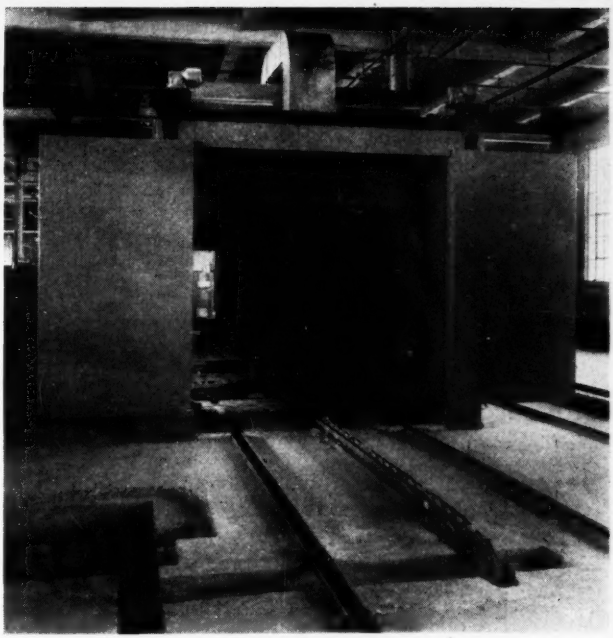


Fig. 2—Exit end view of system, showing baking and cooling zones, exit motorized doors, floor conveyor and trucks.

freshly finished work, the first zone of the oven system is a pressure-type zone which is supplied with fresh, filtered air, delivered under pressure at room temperature. This air delivery, from a separate steam-heated heating system, builds up a pressure within the zone so that dust-laden air from the shop cannot enter and settle on the work before it is carried to the preheating zone.

In addition to the unusual precautions against dust, this system was engineered with three major considerations in mind. They are as follows:

1. Minimum handling of work and minimum labor in operation of the complete oven system.
2. Maximum economy through full utilization of fuel and heated air.
3. Wide range of temperatures and baking times and consequent wide range of usefulness.

Throughout the entire system, all handling of work is conveyorized and, of course, automatic. At the exit end of the oven, trucks loaded with finished work are carried directly to a storage and packing area, and after the trucks are unloaded, they are transferred to a return truck conveyor which returns them to the spray booths. The need for oven attendants is eliminated by completely automatic temperature and safety control equipment.

To describe the operation of the system, one truck will be taken through the entire finishing operation, with a description of each component operation.

Spray Booths

Because the production capacity of the entire system required it, two double spray booths of the water-wash type were installed. These booths measured approximately 12 feet wide x 6 feet deep x 7 feet high in the work chamber. The two booths were set facing each other with space between them to accommodate the oven conveyor.

Freshly cleaned metal assemblies are brought in to the spray booths directly from the cleaning and degreasing area. Many of the assemblies are large and bulky, and the heavier ones are handled on an overhead tramrail system which is designed to place the units on a turn-

table for spraying. After spraying, the larger pieces are loaded directly onto the waiting trucks, which are engaged by the conveyor. After being placed on the trucks, the pieces are finish sprayed to completely cover the unsprayed places where tramrail hooks were placed, and then the spray operator starts the conveyor which carries the truck to the ventilation zone.

Oven Zone No. 1—Ventilation Zone

The ventilation zone is primarily a separate air-conditioned zone used to store the freshly painted work before it is admitted into the pre-heat zone of the oven proper. The ventilation zone will accommodate three trucks, equalling approximately 15 minutes of spray painting production.

To assure dust-free painted surfaces, the air within the ventilation zone is taken from outside the building and is passed through steam tempering coils until its temperature is 70 degrees F. The air is handled by a multi-blade fan and then passed through the steam coils. From the steam coils the air is carried through sheet metal ductwork to the ventilation zone. From this zone the air goes to an exhaust stack at the ceiling and thence to atmosphere. By maintaining this entire zone at positive pressure with filtered and heated air, it is impossible for dust particles encountered in ordinary factory air to be deposited on the work. The exit end of the ventilation zone can be seen in Fig. 1.

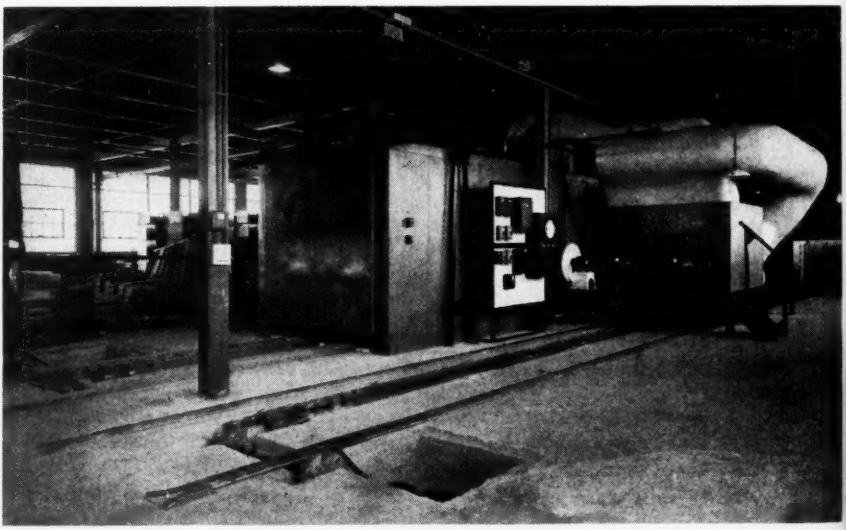
Oven Zone No. 2—Preheating

The work truck's next movement is into the preheating zone of the oven proper, where the oven exhaust air is utilized to preheat the work and to begin the preliminary evaporation of the paint solvents. It is in this zone that the greatest portion of the solvents are released from the work and immediately exhausted to the atmosphere.

Two excellent results are accomplished:

1. Solvent-laden air is localized in this one zone, thereby reducing

Fig. 3—Exit view showing heating equipment, panel board, oven conveyor, and return truck conveyor passing under the heater.



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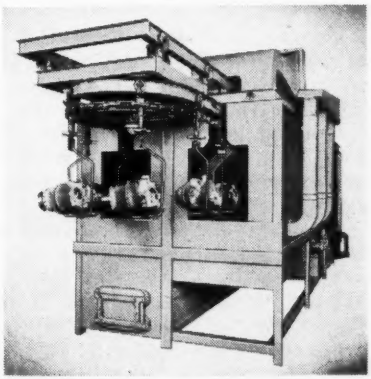

Incidentally, the above planes are: Republic P-47 Thunderbolt . . . Vega B-34 Ventura . . . Voight F-40 Corsair . . . Boeing B-17 Flying Fortress . . . Consolidated B-24 Liberator . . . Martin A-30 Baltimore . . . Vultee A-31 Vengeance . . . Avro Lancaster 1 (Br.) . . . Ilyuchin 2 Stormovik (Russian). *Courtesy Aviation.*

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the solvent concentration in the main baking zone.

2. Finished luster, gloss and hardness is greatly increased due to the fact that the baking zone air is considerably freer from solvent vapors. Final oxidation or polymerization can take place more rapidly and thoroughly.

The advantages that arise from the use of this preheat zone are inexpensively attained, because the heated air for this zone is only the normal exhaust air from the entrance end of the baking zone. Under usual conditions this heated air would be exhausted. Naturally, this exhaust air is at the same approximate temperature as the baking zone. Literally, in utilizing this heat in the normal exhaust air, the overall thermal efficiency of the system is increased; this directly results in lower fuel costs.

As far as the design of this zone is concerned, it is incorporated in the main oven housing. It is separated from the ventilation zone by horizontal automatic doors. Both doors are in complete control interlock with the main synchronous timer of the conveyor.

Sheet metal ductwork is provided in this zone to direct the waste air most effectively over the work. Suitable exhaust ductwork and fan systems finally remove this air after it has given up its heat to the work.

At this point in the system the solvent content, although far below the lower explosive limit, is no longer suitable for use.

Analysis of several installations of this design shows an entering temperature of this air of 250 degrees F. and a final exhaust temperature of 115 degrees F., while a solvent analysis shows an entering vapor content of 0.5 per cent and a leaving content of 1.5 per cent, indicating that two-thirds of all the paint solvents are evaporated in this zone. (Solvent concentrations are expressed in volume percentages of solvent vapors in the exhaust air.)

Oven Zone No. 3—Baking Zone

From the preheat zone the work is automatically transferred to the baking zone, where the final oxidation of the finish is accomplished.

This zone is equipped with large-volume supply ducts located on either side of the oven and carrying adjustable streamlined high-velocity outlets arranged at the conveyor stop position. At the entering end of this zone a separate exhaust duct and fan system provide the required ventilation and furnish the waste heat air for the preheat zone. At the exit end a recirculation pickup duct returns the hotter oven air back to the air heater for reheating and recirculating.

Naturally, as the work passes through this zone its temperature is increased to the baking temperature. Accordingly, the heated supply-air, after it has passed over the work, is hotter at the exit end and cooler at the entrance. Likewise, for utmost utilization of the heated air, only that air from the exit end of the baking zone is carried back to the air heaters for recirculation.

Despite the difference in work temperatures from one end of this zone to the other, complete uniformity in the air stream temperatures is maintained by the use of a great number of air changes per unit time. In fact, the volume of air handled in this heating system exceeds the amount that is used in high speed metallic heat treating oven and draw furnaces.

The idea sometimes prevails that handling larger volumes of air is not economical in fuel input. This is actually and mathematically untrue. Large air volumes assure:

1. Close temperature uniformity.
2. Lower exhaust air temperature.
3. Greater heat transfer from air to work.
4. Usually reduced oxidizing times.

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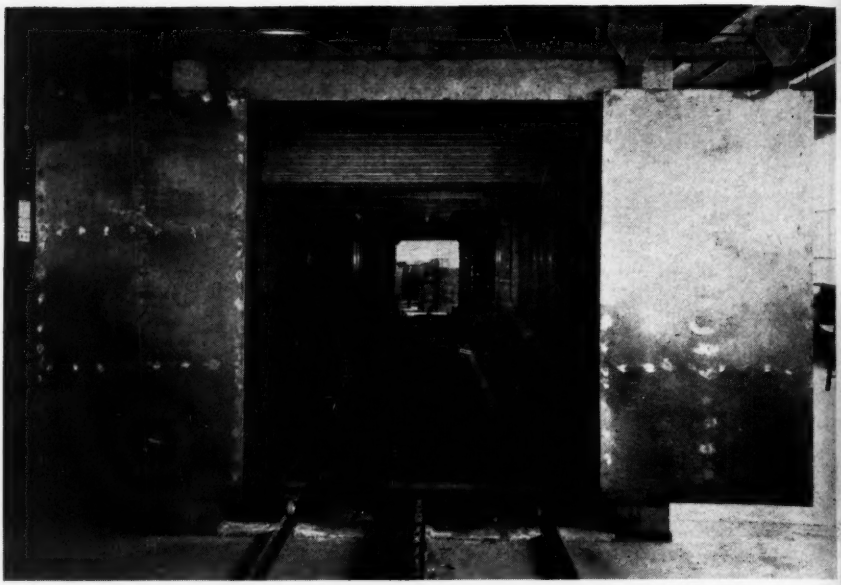

Fig. 4—Full "head-on" illustration of the oven during erection.

Taken overall, an efficiently designed system embodying these advantages can be operated on the same fuel input as other systems. Figure 2 is an exit end view of the system, showing the baking and cooling zones, exit motorized doors, floor conveyor and trucks.

Oven Zone No. 4—Cooling Zone

Normally, after completion of the baking in some oven systems, the work is discharged from the oven and allowed to cool (give up its heat) in the room. However, in this completely engineered system, it was decided to utilize the heat that is carried out of the baking zone by the work proper. This was done simply by the installation of a forced cooling system within the oven system and by recuperating the heat in the work.

Accordingly, a separate zone was incorporated and separated from the baking zone by vertical motorized doors and from the ends of the oven proper by means of horizontal motorized doors. These sets of doors were tied into the synchronized operation of the conveyor so that the doors opened on conveyor operation and closed on conveyor rest.

The cooling zone proper is an insulated enclosure which is equipped with adjustable air inlet grilles mounted in the side walls at the floor level. The grilles also carry air filters for dust removal. From these filtered grilles the room air passes into a fan and duct system which delivers this air under pressure to and over the work. Naturally this air cools the work and as the air picks up the heat from the work, its temperature is increased. The temperature of the cooling air ultimately reaches about 175 degrees F. at a point where it leaves the cooling zone. From the cooling zone the air is carried in a separate duct built inside the oven to the inlet side of the air heaters, where it goes

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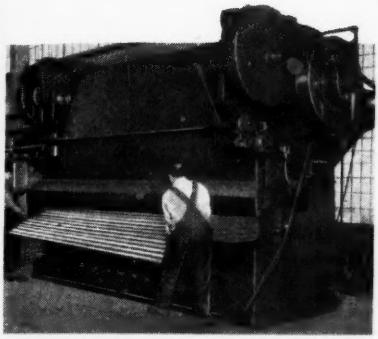

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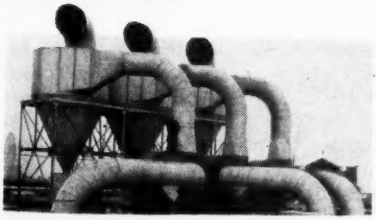

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into the heaters as fresh makeup air.

Normally this makeup air comes from the room or from the outside at temperatures usually around 70 degrees F. In this design of heating system, the makeup air goes into the air heaters at a 100 degrees higher temperature. This temperature difference asserts itself in decreased fuel consumption by a partial recuperation of the incipient heat that is in the work. In normal systems this heat is completely wasted.

(This same basic principle has been previously used by this company for not only paint finishing but also core baking, rubber processing and high speed continuous multicoat saturation and lacquer finishing of insulated wire and cable, textiles and cordage.)

In leaving the cooling zone the work has dropped to a temperature of approximately 115 degrees F. It is now cool enough for handling, as the finish is hard baked and not tacky or sticky.

However, in this one particular installation, the next operation (packing) could not be done at close proximity to the discharge end of the oven. Accordingly the work remains on the truck and is carried by the oven conveyor until it reaches the packing area, 40 feet from the oven proper. At that point the loaded trucks are automatically discharged from the drag conveyor. Here the trucks are manually unloaded. The empty truck is thereupon pushed onto a return conveyor which delivers it at the starting end of the system. (The return truck conveyor can be seen in Fig. 3. It is shown running along the oven proper and underneath the air heater platform for space saving.)

The foregoing describes in detail the following finishing operations, all of which are broken down into automatic or semi-automatic continuous operation:

1. Surface cleaning.
2. Paint spraying.
3. Surface ventilation.
4. Preheating.
5. Finish baking.
6. Cooling.
7. Unloading.
8. Truck return.

Oven Construction

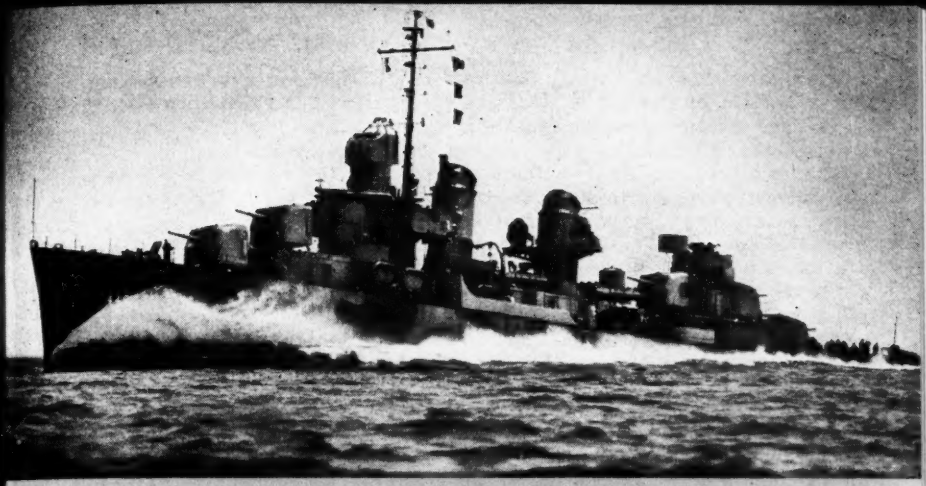
The installation is basically one oven shell approximately 75 feet long. The work clearance is 88.6 inches wide x 8 feet 9 inches high throughout the system. The oven shell is constructed of 4-inch x 20-gauge x 18-gauge glass-wool insulated oven panels. The floor area is further insulated with 3-inch x 16-gauge similar panels. The ends of the oven are sealed with horizontal motorized doors. The sealing between all the zones within the oven shell is done with slat type vertical motorized roll curtain doors constructed of 16-gauge steel slat. These doors are not insulated.

Supply ductwork for air handling is mounted on either side at the floor level, to direct the air most efficiently over the work. Recirculation and exhaust ducts are mounted either on the underside of the ceiling or on the side walls close to the ceiling.

Heating System

Because of the heavy hourly loads to be run and the exceptionally large volume of air to be circulated for temperature evenness in the oven, a 2,000,000 BTU indirect fired heating system is provided. On a 70-degree F. basis, a total of approximately 17,000 cfm are circulated, the greater part of which goes through the air heaters to the ovens and from the ovens to the air heaters. The air heaters are mounted in tandem for battery operation, and provisions are made to run only one of the two units in case of insufficient production.

On the air-handling side of the heating system, air is supplied under pressure by a recirculating fan, the suction side of which is connected to the oven system. Not all of the air



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is circulated through the air heater, but a portion of the air is bypassed to reduce static pressure build-up through the tube stocks.

The heaters are fired with two atomizing-type proportioning fuel oil burners arranged for commercial grades of fuel oil. The burners operate on 18-pound oil pressure and 20-ounce combustion air pressure supplied by a turbo blower.

At the outlet of the combustion gas of the air heater, a high temperature exhaust fan is used to assure positive combustion gas circulation through the interchanger. The pressure side of this waste gas fan is connected to an exhaust stack. At the outlet of the hot gas fan is a pressure duct connected back to the combustion zone. Thus through the use of adjustable volume dampers a maximum quantity of the waste combustion gases are recuperated and their incipient heat is used to effect further operating economies. By the recuperation of these combustion gases an estimated 10 per cent reduction of fuel cost has been effected.

All of the heating equipment is mounted at the side of the oven as shown in Fig. 3.

Control Equipment

It was necessary to control the temperatures of the system very closely, so that whites and pastel shades could be easily matched. This is accomplished by the use of a mercury-actuated remote bulb recorder controller, the bulb of which is mounted in the baking zone of the oven proper. Another similar indicating controller bulb is mounted in the heated air supply duct at a point where the duct goes into the oven. In addition, non-indicating temperature controllers are mounted in the individual outlets of each air heater. Series parallel wiring connects these controllers to a heavy duty motor that varies both the fuel oil and combustion air input to the actual heat requirements at any one of four points in the system.

Safety control equipment including photoelectric flame relays guards the complete system against fuel, combustion air, current, pilot or motor failure.

Under or over voltage fluctuating conditions are taken care of by under and over voltage relay equipment. Air switches interlock all fans with the conveyor operation.

Conveyor

The conveyor is used to propel the loaded work trucks through the entire system as shown in Fig. 4. This conveyor is a 4-inch pitch drag chain type with retractable type pusher dogs on 5-foot centers. Alternate 2-foot retractable return dogs are provided to prevent the trucks rolling forward. The chain rides in heavy structural channel tracks equipped with heavy rolled-plate wearing dogs. The head-shaft to tail-shaft centerline is approximately 120 feet, indicating the overall length of the system. The main conveyor drive consists of a variable speed motorized reducer equipped with disc brake and torque-limiting device. The brake is used to prevent conveyor coast and the torque-limiting mercury clutch limits horsepower and prevents jamming of the conveyor in case of accidents.

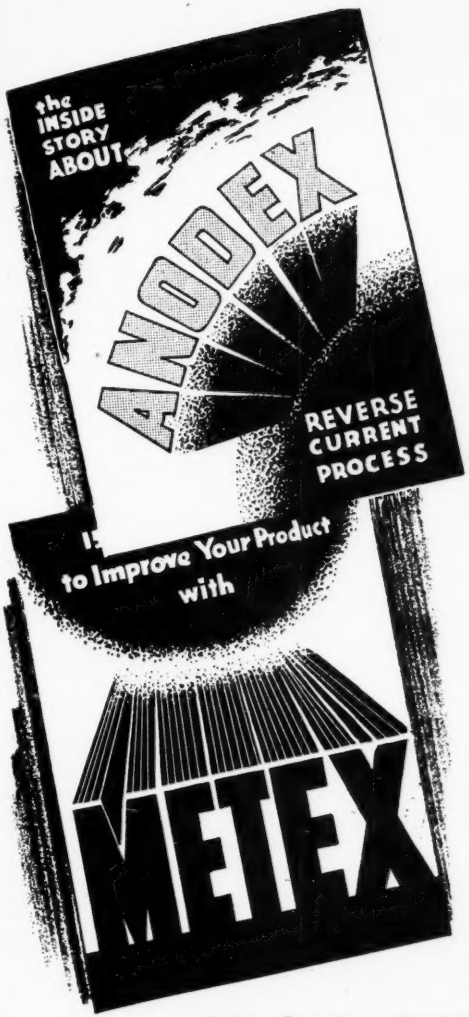
Conveyor control consists of the necessary timing drive to start and stop the system and the necessary limit switches and control actuators to perform the following synchronized circle.

1. Conveyor at rest.
2. Timer times out.
3. All doors open.
4. Conveyor advances one station.
5. Doors close.
6. Conveyor rests.

The complete control cabinet to accomplish this function is shown on the main control panel at the front of the air heater.

Capacity

The capacity of the system is 12,-



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000 pounds of steel parts per hour. Each truck weighs approximately 300 pounds.

Conveyor timer setting can be adjusted between 12 and 24 impulses per hour, giving an overall baking time of from 45 to 90 minutes at temperatures ranging between 175 degrees and 450 degrees Fahrenheit.

This type of equipment exemplifies the trend in modern industry toward efficient combination of semi-automatic handling equipment operating in connection with high-speed convection-heated ovens. War demands have accelerated the manufacture and adoption by industry of such equipment, but the true value of it will become more apparent in peace time, when a competitive market will make operating economies imperative.

Shellac

BECAUSE the outlook for increased imports of shellac now appears brighter than at any time during the last two years, the War Production Board announced recently that it is planning to amend Allocation Order No. M-106 to make some of the higher grades of shellac available for civilian uses. The contemplated amendment also would eliminate large amounts of paper work.

Proposals for easing the restrictions were discussed at a recent meeting of WPB's Shellac Industry Advisory Committee. The members agreed that some relaxation of the restriction is desirable at this time. WPB representatives also announced that plans are being made for easing present restrictions on inventories under the order.

Shortage of Steel Cylinders

THE acute shortage of steel cylinders for shipping is threatening to bottleneck the flow of ammonia, essential for producing ships, tanks, planes and weapons, and for refrigerating vital food supplies, it was revealed recently. Warning that the situation is becoming critical was contained in an appeal by the National Ammonia Division of E. I. du Pont de Nemours & Co. to industrial consumers to empty and return the cylinders in which they receive ammonia promptly. The supply of cylinders is adequate to handle all requirements if they are kept moving between consumer and producer.

Wire Grommet V-Belt. A four-page folder on its line of V-belts, featuring information about its recently announced wire grommet type, has been published by The B. F. Goodrich Company, Akron, Ohio, and is now available upon request. The wire grommet V-belt is an exclusive development of the company, the result of research engineering into special power problems.

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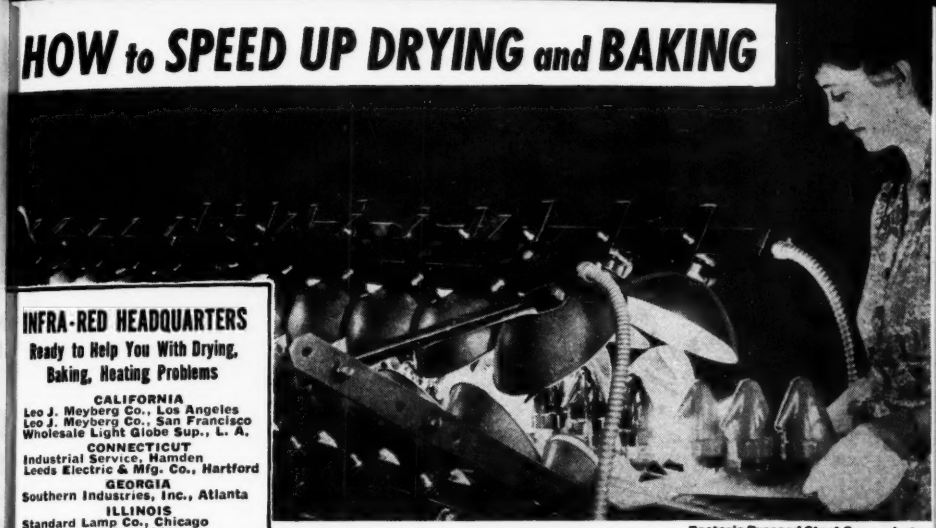

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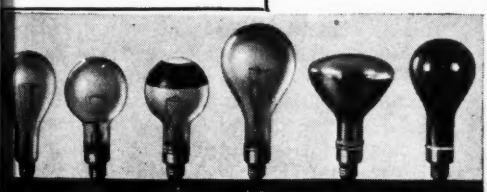

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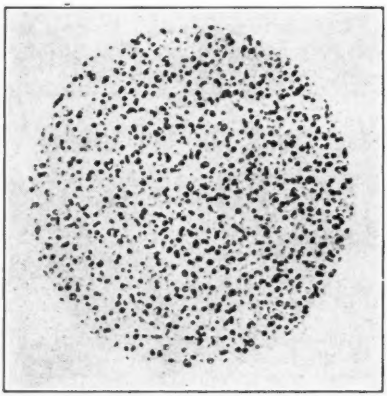
Classification of Pigments

By JEFFREY R. STEWART

GENERALLY speaking, we can say that a pigment is a fine solid particle, the primary function of which in a paint, enamel or lacquer is to impart hiding power. In other words, it is used to convert an oil, varnish or clear lacquer from the transparent stage to an opaque condition. (An exception to this statement is the use of inert or extender type pigments, such as silica, barium sulfate, asbestine, powdered mica, whiting, talc, China clay and so on.) There are, of course, other functions of a pigment, such as increasing the covering power, improving the durability or preservative power, and imparting beauty and a permanent color to the finish.

For convenience, pigments should be classified into four general groups.



An example of an acicular or needle-shaped type of pigment.

These are as follows:

1. White pigments — such as titanium dioxide, zinc oxide, lithopone, zinc sulfide, and so on.
2. Dry colors — colored pigments such as Prussian blue, chrome yellow, chrome oxide green, para red toner, and so on. These may be used either as a tinting pigment or as the main pigment ingredient in a paint.
3. Inert or extender pigments—such as silica, barytes, talc, and so on.
4. Miscellaneous pigments—such as aluminum bronze powders, electrolytic cuprous oxide, luminous calcium sulfide, red mercuric oxide, and so on.

In the metal-finishing industry, pigments are of enormous importance because nearly all finishes used on metal are opaque and not transparent, as contrasted with the wood-finishing industry. However, only certain pigments are selected when it is known that the finished product is to be used on metal, rather than on wood or some other construction material. For instance, a paint formulator would hardly resort to the use of white lead pigment (chemically, this is basic carbonate of white lead or basic sulfate or white lead) in the production of a fast and hard-drying enamel. While it is true that white lead is the most widely used pigment in this country, the greatest tonnage of it goes into the production of ready-mixed outside house paints and for paste white lead in oil. Since this type of painting is outside the sphere

of the metal-finishing industry, only casual mention will be made of it, as well as of a few of the other pigments which are consumed in large quantities for constructional materials other than metal.

Relationship Between the Name of a Paint and Its Pigment

Many finishers of metal products use the name of a paint to indicate the color of the finish without much knowledge of the pigment used to produce the color. For instance, very few spray mechanics know or realize that the pigment in a cadmium red paint or enamel is really cadmium sulpho-selinide which has been co-precipitated with barium sulfate and which is expressed chemically as:

Cadmium red is Cds + CdSe + $BaSO_4$ which equals cadmium sulpho-selinide.

This is the most permanent brilliant red pigment known to the paint industry today. It is used primarily where the possibility of fading must be eliminated. The following table gives, in condensed form, a list of the better known and stable pigments, together with their chemical or physical nature.

It is important to remember that the chemical formulas used in this table are not intended to indicate the exact chemical composition of the pigment. The reader should recognize that in the preparation of certain pigments, it is often necessary to incorporate modifying materials which are not necessarily regarded as fillers, extenders or adulterants.

Paint Name	Pigment
Alizarin crimson	The synthetic or natural red organic dyestuff 1-2 dihydroxyanthraquinone precipitated on a base of aluminum hydrate.
Alizarin rose madder	The synthetic or natural red organic dyestuff 1-2 dihydroxyanthraquinone precipitated on a base of aluminum hydrate.
Aluminum bronze	A silver-like fluffy powder containing 99 per cent pure aluminum, coated with a stearate compound. Also sold in paste form, in which case it is mixed with mineral spirits.
Bone black	Also known as drop black. Made by burning animal bones or other organic matter in closed vessels. Contains about 80 to 85 per cent calcium phosphate, the balance being principally carbon (C) and moisture (H_2O).
Burnt sienna	Iron oxide prepared by calcining the natural earth, raw sienna.
Burnt umber	Iron oxide and manganese dioxide pigment prepared by calcining raw umber.
Cadmium orange	Cadmium sulfide, CdS, or cadmium sulpho-selenide, CdS + CdSe.
Cadmium red deep Cadmium red medium Cadmium red light	Cadmium sulpho-selenide, CdS + CdSe.
Cadmium-barium red deep Cadmium-barium red medium Cadmium-barium red light	Cadmium sulpho-selenide co-precipitated with barium sulphate, CdS+CdSe+$BaSO_4$.

Cadmium yellow deep Cadmium yellow medium Cadmium yellow light	Cadmium sulfide, CdS.
Cadmium-barium yellow deep Cadmium-barium yellow medium Cadmium-barium yellow light	Cadmium sulfide co-precicipated with barium sulfate, $CdS + BaSO_4$.
Carbon black	The highest tinting strength pigment in the black classification. The main constituent is carbon (C).
Cerulean blue	Combined oxides of cobalt and tin, $CoO.nSnO_2$.
Chrome green	A combination of lead chromate ($PbCr_2O_4$), ferric ferrocyanide, extenders, and/or insoluble lead salts.
Chrome yellow	A wide term used to indicate a pigment containing lead chromate ($PbCr_2O_4$), lead oxide (PbO), lead sulfate ($PbSO_4$), and/or lead molybdate ($PbMoO_4$).
Chromium oxide green	Anhydrous chromic oxide, Cr_2O_3.
Cobalt blue	Combined oxides of cobalt and aluminum, $CoO.Al_2O_3$.
Cobalt green	Combined oxides of zinc and cobalt, $CoO.nZnO$.
Cobalt violet	Anhydrous cobalt phosphate, $Co_3(PO_4)_2$, or arsenate, $Co_3(AsO_4)_2$.
Cobalt yellow	Potassium cobaltinitrite, $CoK_3(NO_2)_6\ H_2O$.
Flake white	Basic lead carbonate, $2PbCO_3.Pb(OH)_2$.
Green earth	Natural earth consisting chiefly of the hydrous silicates of iron, aluminum, magnesium and potassium.
Indian red	Nearly pure iron oxide, Fe_2O_3. It may be either natural or artificial in origin.
Iron yellow	Similar to yellow ochre.
Ivory black	Amorphous carbon produced by charring animal bones.
Lamp black	A nearly pure amorphous form of carbon made from the condensed smoke of a luminous flame.
Light red	Natural iron oxide, Fe_2O_3, with varying proportions of inert.
Lithopone white	A synthetic white pigment composed principally of barium sulfate and zinc sulfide. $BaSO_4$ plus ZnS. The War Production Board classifies lithopone pigment into the following groups: normal, high strength barium, high strength calcium, high strength magnesium, titanated and pure zinc sulfide.

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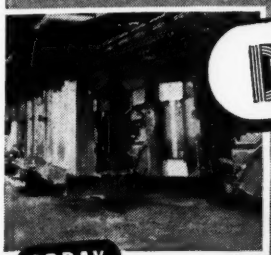

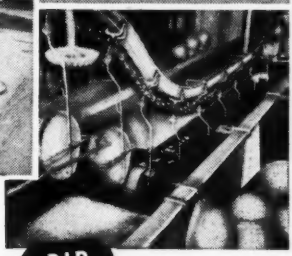

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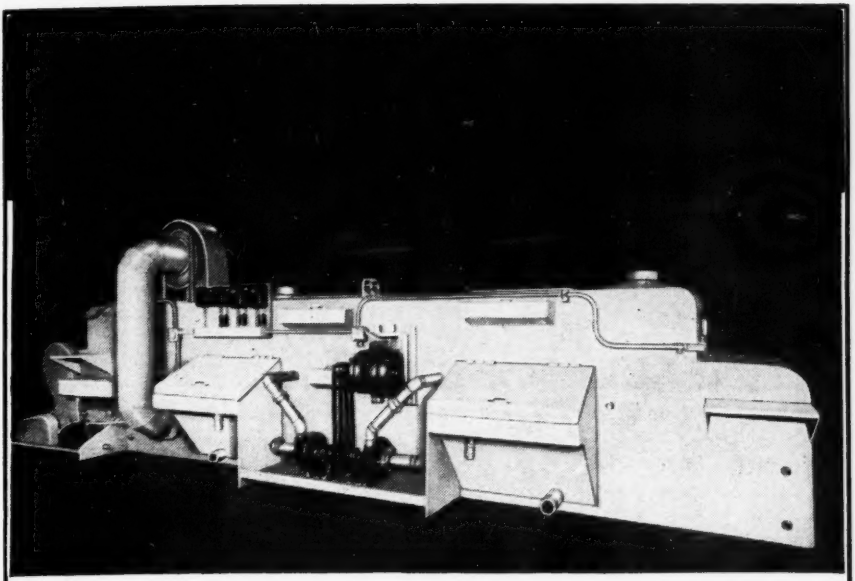
Luminous paint	This is a highly specialized type of pigment which permits the paint to be visible in the dark. It will be discussed in detail in a separate article at a later date. Chemically, it is usually calcium sulfide (CaS).
Manganese blue	Barium manganate with barium sulfate, $BaMnO_4 + BaSO_4$.
Manganese violet	Manganese ammonium phosphate, $MnNH_4PO_4$.
Mars orange	Artificial ochre consisting chiefly of iron and aluminum oxides, $Fe_2O_3 + Al_2O_3$.
Mars red	Artificial ochre consisting chiefly of iron and aluminum oxides, $Fe_2O_3 + Al_2O_3$.
Mars violet	Artificial iron oxide, Fe_2O_3.
Mars yellow	Artificial ochre consisting chiefly of hydrous oxide of iron and aluminum, $Fe_2O_3.nH_2O + Al_2O.nH_2O$.
Mineral black	An indefinite pigment which has not yet been clearly defined. It could be composed of iron oxide (Fe_3O_4), or a combination of cobalt and nickel salts, or a material composed largely of manganese dioxide (MnO_4).
Prussian blue	Ferric ferrocyanide, $Fe_4(Fe(CN)_6)_3$. Commonly called iron blue or ferric ferrocyanide blue.
Pure titanium	Contains 100 per cent ferric ferrocyanide. Titanium oxide or titanium dioxide, TiO_2.
Phthalocyanine blue	A synthetic organic dyestuff which is copper phthalocyanine.
Phthalocyanine green	A synthetic organic dyestuff which is chlorinated copper phthalocyanine.
Raw sienna	Natural earth that consists chiefly of the hydrous silicates and oxides of iron and aluminum.
Raw umber	Natural earth that consists chiefly of the hydrous oxides and silicates of iron and manganese.
Red lakes and toners	There are a wide variety of these pigments with varying ratios of pure lakes (organic) to extenders (inorganic).
Red lead	An orange pigment, composed principally of red lead oxide (Pb_3O_4). The amount of Pb_3O_4 usually varies between 85 and 95 per cent.
Silver bronze	A variety of gold bronze powders are available during normal peace times, their use being highly restricted at present. They contain principally aluminum (Al), antimony (Sb), bismuth (Bi), cadmium (Cd), chro-



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	mium (Cr), copper (Cu), silver (Si), tin (Sn), and zinc (Zn).
Strontium yellow (lemon yellow)	Strontium chromate, $SrCrO_4$.
Titanated lithopone	A combination of titanium dioxide, barium sulfate and zinc sulfide. $TiO_2 + BaSO_4 + ZnS$.
Titanium white	A white containing at least 30 per cent titanium dioxide, TiO_2, and free from lead, balance either $BaSO_4$ and/or ZnO.
Tuscan red	A red pigment usually made by combining an iron oxide with a lake. Sometimes extenders are used such as barium sulfate, silicon dioxide, and so on.
Ultramarine blue	Complex silicate of sodium and aluminum with sulfur.
Ultramarine green	Complex silicate of sodium and aluminum with sulfur.
Ultramarine red	Complex silicate of sodium and aluminum with sulfur.
Van Dyke brown	Bituminous earth or lignite with small amounts of iron, alumina and silica.
Venetian red	Artificial or natural iron oxide with varying proportions of inert.
Vermilion	Mercuric sulfide HgS. Can be designated as English, French or Chinese.
Viridian	Hydrous chromic oxide, $Cr_2O_3.2H_2O$.
Yellow ochre	Artificial or natural mixture of hydrous iron oxide with alumina and silica.
Zinc white	Zinc oxide, ZnO.
Zinc yellow	Zinc chromate, $ZnCrO_4$.

A Job for the Paint Chemist

Although the number of tests required to evaluate a pigment are comparatively few, the time and expense involved is an item of importance as compared with some of the other raw materials consumed by the paint industry. Usually, when a new pigment is under examination, the first thing that the chemist does is to note how it mixes with the various vehicles—such as linseed oil, synthetic resin solution, varnish or clear lacquer. This is usually accomplished by rubbing some of the vehicle with the pigment on a ground glass plate with a spatula or flexible knife. If the pigment is not easily wetted by the rubbing action, or if some detrimental reaction takes place, this is usually considered a great disadvantage, and the sample may be completely rejected and further tests may be restricted or possibly eliminated entirely.

If the sample passes this requirement and appears to form a nice smooth paste, a more detailed examination should be made. The first test under consideration should be the oil absorption determination. This is merely a measure of the amount of oil a known weight of pigment will absorb to bring it to a definite consistency. Usually, one gram of the

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The proper selection of masking lacquers and their methods of application are extremely important if satisfactory results are to be obtained. When parts to be hard chromium plated are masked, different materials and procedures are used than for parts masked for copper plating prior to carburizing. In copper stop-off, too, variations in surface finish of the parts make it advisable to adopt different methods and use specific types of stop-off lacquer.

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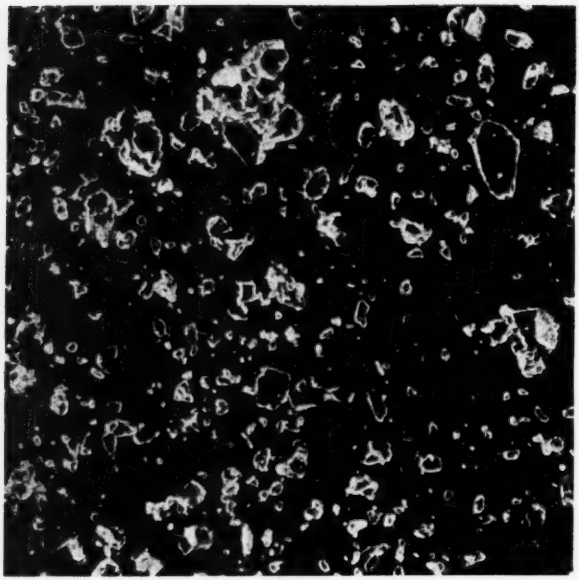

Micronized mica. (330 magnifications.) An example of an exfoliated or flake-like type of pigment.

pigment is accurately weighed out and oil added, drop by drop. At the same time the two ingredients are rubbed vigorously with a stiff pallette knife or spatula, using a ground glass plate for the surface. The number of grams of linseed oil required to wet the pigment completely is known as the oil absorption value.* This may vary all the way from 4.0 to as high as 50 or 60.

If the pigment is intended for use in enamels or lacquers, the wetting medium can be substituted for the linseed oil, being certain, of course, to mention the substituted vehicle when reporting the results. Generally, a low oil absorption value is to be desired, especially if the pigment does not have a high hiding power or strong tinting strength. The lower the oil absorption value, the greater the amount of pigment that can be incorporated into the paint. This results in increased hiding power and color intensity. There are cases, however, when a low oil absorption value is not necessarily desirable. Aside from the economic standpoint, there are such technical reasons as flow, gloss, hiding power and color intensity which will determine for us whether the oil absorption value is at its optimum or not.

Freedom from coarse particles is of great importance. In a rough manner, this can be determined merely by incorporating the pigment with the vehicle, spreading it on a piece of glass, and noting whether or not a pimply film is produced. A better and more scientific, way to determine whether or not coarse particles are present is to wash the pigment through a 325-mesh screen with water or alcohol, and note the percentage of particles retained on the screen after drying.

In the paint industry, the 325-mesh screen has been arbitrarily set as the dividing line. Pigment particles which will pass through this screen are considered as fine particles which are satisfactory for use in paint, whereas those particles that fail to pass through the mesh openings are regarded as coarse particles. Usually the maximum amount permitted is a retention of not more than 0.5 per cent. The only exception to this specification is extended to the testing of aluminum bronze powders. In such a case it is customary to substitute a 200-mesh screen in place of the 325-mesh screen.

THE IDEAL POSTWAR Experimental projects designed to increase the

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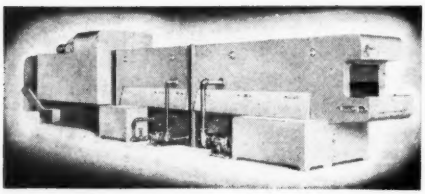
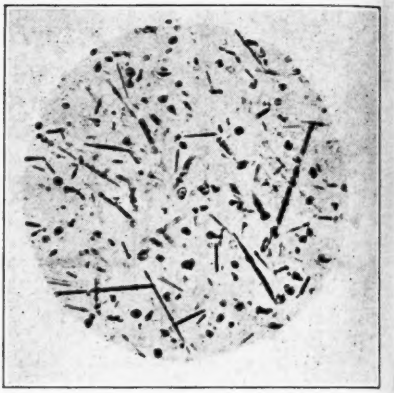


Conveyor-Spray

American

FOUNDRY EQUIPMENT CO.

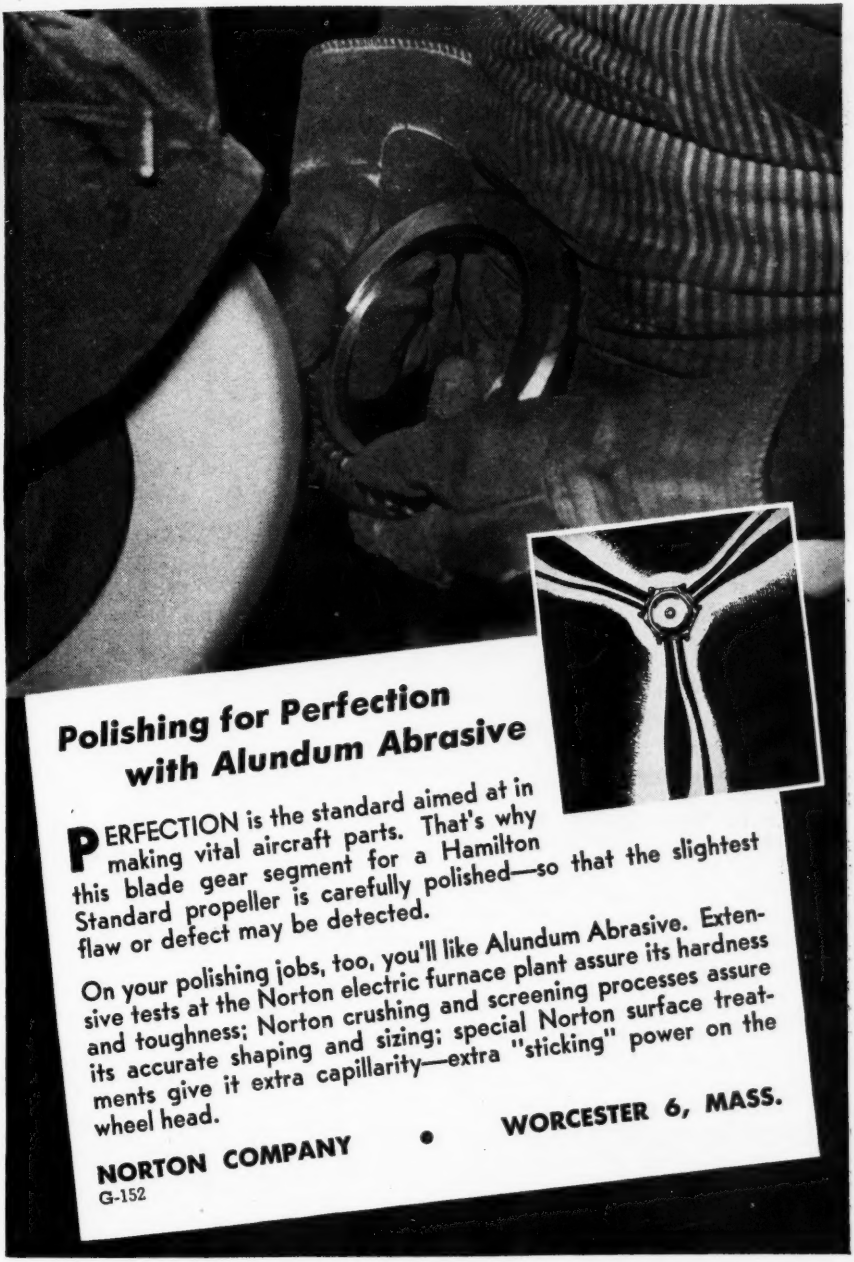
Now, having determined the fineness and the oil absorption, it is best to proceed to the determination of the specific gravity. When dealing with most other familiar materials, such a test is rather simple. However, when we work with pigments, the test is much more involved. This is not only due to the fact that we have air spaces and interstices in the



An example of a nodular or spherical type of pigment.

pigment sample, but also because some of the air is in the occluded form. In other words, it is difficult to remove the air from the pigment surface.

For this reason, it is necessary to resort to the use of a vacuum of at least 3 mm. when making the specific gravity determination. Since the minimum price of a vacuum pump and accessories is somewhat over $200, it is advisable to postpone the specific gravity determination until the last, unless all the equipment is already available. If the apparatus is not complete, it is sometimes advisable to send the work out to a private testing laboratory that will usually charge about $10 per sample or three samples for $25. The reason why the specific gravity test is important is



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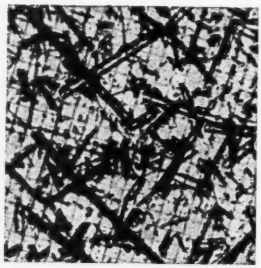
G-152

because this value is required in determining the bulking value of the paint. Pigments are purchased by the pound, whereas the result paint is sold in volume by the gallon. Knowledge of the specific gravity facilitates the calculations and aids the cost accountant.

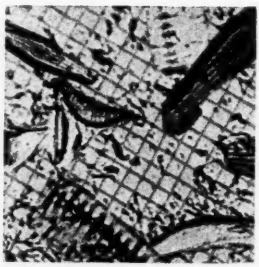
that he will ultimately consume. For the reader who wishes to study this subject in greater detail, there are several textbooks, handbooks and laboratory notebooks available.

The Structure of a Pigment

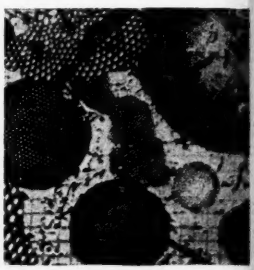
When a pigment is observed under a microscope, it is usually noted that



Acicular



Spicular



Diatoms

Photomicrographs of Diatomaceous Silica

Diatomaceous silica is used in the paint industry under various trade names such as Dicalite, Celite, and so on, and is now being used extensively for such purposes as flatting agents, inert extenders and suspension agents. The main advantages of its use are: non-penetration of the vehicle and hardening of the film; better adhesion, and so on. These properties are attributed to the fact that through the proper use of diatomaceous silica, porosity of the film is controlled so that the film is allowed to "breathe," especially when applied to porous objects.

The three tests which have been discussed are all that are required for a preliminary evaluation. In the case of colored pigments, it is rather important to determine the tinting strength of the material. This is a relatively simple test which is described in most of the laboratory handbooks. In the case of white pigments it is customary to make a test for hiding power, coefficient of reflectance (whiteness) and possibly tinting strength. The type of test and the number of determinations will vary with the purpose to which the pigment is to be applied.

The industrial finisher will rarely have occasion to make all of the tests on pigments, since most of his tests are confined to the finished product. However, it is desirable that we have at least a brief idea regarding the methods used to determine which pigments are to be used in the paints a definite form or structure is apparent. Some pigments are fibrous in nature; asbestine is a good example of a fibrous type of pigment. Some are exfoliated (flake-like), such as powdered mica and graphite. Others are acicular (needle-like), and there is also the nodular (spherical) type, which is almost the converse. It is often desirable to make a photomicrograph of the pigment, especially if a record is desired.

The illustrations which accompany this article show some interesting views of various types of structure.

It is claimed by some authorities that a paint or enamel composed of a combination of various structure types is more durable and weather-resistant than one made with a single pigment. Generally speaking, this is true; however, there are a few exceptions to this case.

(To be concluded next month)

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The Chemistry of Electroplating

By Dr. C. B. F. Young, Consultant

Part 7

IN the previous article the subject of solutions was discussed in some detail. Emphasis was placed on the material as solutions are very important to the electroplater. In the latter portion the determination of molecular weights was discussed.

The present article deals with the compounds of nitrogen and their properties.

If ammonia is passed over hot copper oxide the gas is decomposed. Water and nitrogen are formed while, on the other hand, if ammonia is passed over hot magnesium, hydrogen is set free. Thus, by breaking ammonia down into its component parts it is found that this material consists of a chemical combination of two gases; namely, hydrogen and nitrogen. It can further be proved by laboratory experiments that the formula for this material is NH_3.

It is quite possible to decompose ammonium hydroxide by heating the solution. As the temperature rises the ammonia will be released from the water, as shown in the equation below.

$$NH_4OH = NH_3 + H_2O$$

It is also possible to prepare ammonia by heating the salt of ammonia with a base. A good example is as follows:

$$(NH_4)_2SO_4 + Ca(OH)_2 = CaSO_4 + 2NH_3 + 2H_2O$$

Nitrides react with water to form ammonia also.

$$Mg_3N_2 + 6H_2O = 3Mg(OH)_2 + 2NH_3$$

Ammonia is a colorless, pungent gas which is about one-half as heavy as air. It is very soluble in water. At 20 degrees one volume of water absorbs 700 volumes of ammonia. The concentrated solution in water has a density of 0.9 and contains about 28 per cent of the gas.

With a trace of water ammonia will react with HCl as follows:

$$NH_3 + HCl = NH_4Cl$$

Ammonia when dissolving in water also unites chemically with it. Thus:

$$NH_3 + H_2O = NH_4OH$$

This further breaks down into hydroxyl ions which will be discussed later. Therefore, ammonium hydroxide is a weak base, as it gives rise to the hydroxyl radical.

Ammonium hydroxide being a base, one would expect it to unite with acids to form salts. Thus:

$$NH_4OH + HCl = NH_4OH + H_2O$$

$$2NH_4OH + H_2SO_4 = (NH_4)_2SO_4 + 2H_2O$$

All ammonium salts decompose on heating, but all do not release ammonia. However, any ammonium salt

heated with a strong base releases ammonia which can be recognized by its odor or its effect on wet red litmus paper.

$$NH_4Cl + NaOH = NaCl + NH_4OH$$
$$NH_4OH = NH_3 + H_2O$$

Insoluble silver compounds dissolve in ammonium hydroxide. Thus, silver chloride reacts as follows:

$$AgCl + 2NH_3 = Ag(NH_3)_2Cl$$

The same is true with copper. If ammonium hydroxide is added to a cupric salt, a precipitate of cupric hydroxide is first formed. As more ammonium hydroxide is added, the precipitate goes into solution, forming a beautiful true blue solution which, in the case of cupric sulfate, is $Cu(NH_3)_4SO_4$ and with cupric chloride, $Cu(NH_3)_4Cl_2$. The formation of this attractive blue color is a test for a copper compound.

Ammonia is used in the preparation of nitric acid, for refrigeration, and fertilizers. Ammonium hydroxide is used by the electroplater in many solutions, and also to adjust the pH of his solutions so that good results may be obtained.

Nitrogen and hydrogen are combined to produce ammonia. Haber made this commercially successful in 1913. The reaction is as follows:

$$N_2 + 3H_2 = 2NH_3$$

At ordinary temperatures the union of the two to form ammonia is very slow. The combination increases up to a maximum and then decreases. If a temperature above 700 degrees C. is reached, the reaction is reversible and all the ammonia will decompose to form nitrogen and hydrogen. Haber discovered, however, that if the pressure on the system was increased, the two elements combine to a greater extent.

If a temperature of 500 degrees C. is used and a pressure of 200 atmospheres (one atmosphere equals 14 lb. per sq. in.), some ammonia is formed which is absorbed in water and dissolved from the process. The remaining gases go back into the reacting chamber again. This reaction is increased if certain catalysts such as iron, uranium, and so on are present. The Claude process operates at 1000 atmospheres, producing a higher yield of ammonia. The nitrogen and hydrogen used in these processes are generally made from water gas which is nothing more than a mixture of hydrogen, nitrogen, and carbon monoxide. The carbon monoxide is removed by liquefaction.

In the union of nitrogen and hydrogen the conditions can be altered so that the reaction, instead of going to the right, goes to the left. Thus, the ammonia is decomposed to form nitrogen and hydrogen. This is true of other reactions which have been encountered in the past; for instance, the formation of ammonium hydroxide from ammonia and water. This brings up a rather interesting study.

If one were to introduce pure ammonia into a container and have a catalyst present in the form of an iron compound, keeping the whole at 500 degrees C. for a few hours and then analyze the product, it would be found that some of the ammonia had disappeared but also some nitrogen and hydrogen would be present. What does this mean? It simply means that the ammonia has decomposed to produce nitrogen and hydrogen.

If this experiment is repeated it would be found that the same amount of ammonia would again decompose, producing the same amount of nitrogen and hydrogen. After a certain definite amount of ammonia had decomposed no more would do so. It can be proved that ammonia is still decomposing and it can also be proved that nitrogen and hydrogen are combining to produce ammonia, and, as fast as the ammonia decomposes, the nitrogen and hydrogen are uniting to form more ammonia. This is called an equilibrium reaction, and will be encountered again. It will be noted

that a catalyst was present. It should be pointed out at this time that a catalyst shortens the time interval for a chemical reaction to reach equilibrium, but it does not change the percentage composition of that equilibrium.

Different temperatures produce different compositions of equilibrium mixtures and in the case of ammonia, the lower the temperature the higher the yield, but this does not take in the interval of time as, in a few paragraphs back, it was stated the higher the temperature the higher the yield. At 500 degrees this was the best temperature, while at 700 degrees no ammonia was obtained. With any given catalyst, the higher the temperature up to a point, the quicker the equilibrium will be attained.

The speed of a chemical reaction may be increased by increasing the concentrations of interacting materials or increasing the temperature of a reaction. As a general rule an increase of 10 degrees C. doubles the speed of a chemical reaction.

Nitric acid is a very important material to the chemist and to the electrochemist. The material is used in the preparation of other chemicals and in the manufacture of explosives and fertilizers. The source of this material is from the nitrates which are deposited in Chile and synthetic manufacture of the oxides of nitrogen. It is important to the electroplater, as it is used to make bright dips and as an ingredient in many specific formulae.

If sulfuric acid is mixed with a nitrate the result is as follows:

$$NaNO_3 + H_2SO_4 = NaHSO_4 + HNO_3$$

It is also possible to oxidize nitrogen in the presence of an electric arc as follows:

(1) $N_2 + O_2 = 2NO$

(2) $2NO + O_2 = 2NO_2$

(3) Hot $H_2O + 3NO_2 = 2HNO_3 + NO$

Another process known as Oswald ammonia oxidation process consists of oxidizing ammonia with oxygen as follows:

(1) $2NH_3 + 5O_2 = 4NO + 6H_2O$

(2) $2NO + O_2 = 2NO_2$

(3) $3NO_2 + H_2O = 2HNO_3 + NO$

This method uses platinum as a catalyst. Most of our nitric acid is made by this process.

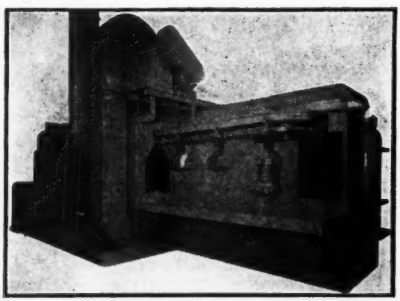
Nitric acid is a colorless liquid with a density of 1.52 and a boiling point of 86 degrees. Many times nitric acid solutions turn a red brown color due to the fact that they slowly decompose into oxides of nitrogen and these, when dissolved, produce the characteristic color of nitric acid. This material is a powerful oxidizing strong acid. Oxides react readily with nitric acid forming water and nitrates.

$$CuO + 2HNO_3 = Cu(NO_3)_2 + H_2O$$

Nitric acid reacts with hydrochloric acid producing water, nitrous acid, and free chlorine.

$$HNO_3 + 3HCl = 2H_2O + NO + 3Cl$$

This mixture of nitric acid and hydrochloric acid is called aqua regia



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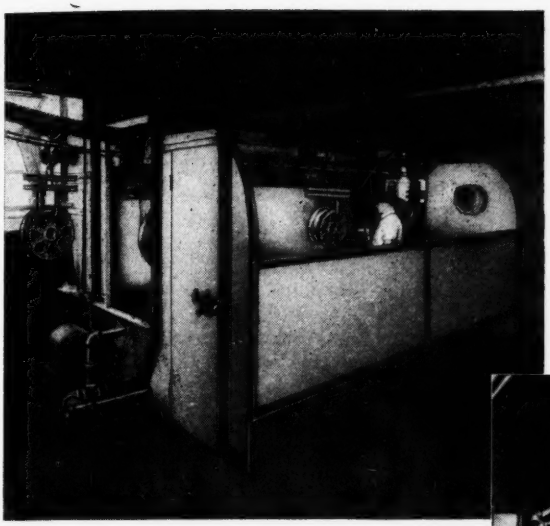
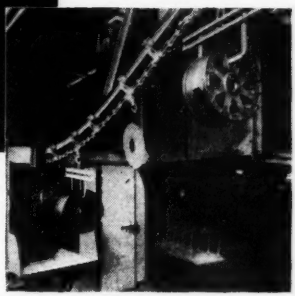


★ *(top) Aircraft wheels being painted in a Peters-Dalton Spray Booth. Air is pulled toward flood sheet carrying away all spray. Constant fresh air in booth.*

★ *(center) Part of same complete system for finish processing bomber wheels. Booth in foreground; oven overhead to provide more useable floor space.*

★ *(lower) Cutaway of individual Hydro-Whirl Spray Booth showing construction and principle (trough type unit).*



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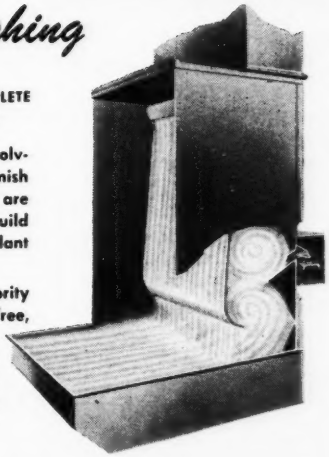

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and will dissolve many of the inert or noble metals such as gold and platinum. This mixture is used by many platers in making up gold solutions.

The salts formed by nitric acid uniting with bases are called nitrates. Thus:

$$NH_4OH + HNO_3 = NH_4NO_3 + H_2O$$

Many oxides dissolve in nitric acid, for instance:

$$FeO + 2HNO_3 = Fe(NO_3)2 + H_2O$$

Nitric acid dissolves all metals except very noble ones such as gold and platinum. Another reaction which is characteristic of nitric acid is as follows:

$$MgCO_3 + 2HNO_3 = Mg(NO_3)_2 + H_2O + CO_2$$

A rather interesting point may be made here to the effect that the nitrates of all metals are soluble; therefore, it will be impossible to precipitate a metallic nitrate. A nitrate generally decomposes on heating as follows:

$$2Hg(NO_3)_2 = 2HgO + 4NO + 3O_2$$

However, sodium and potassium nitrate react somewhat differently.

$$2KNO_3 = 2KNO_2 + O_2$$

Many times the chemist desires to test for the different radicals. A method for testing for the chloride radical has already been given, and listed below is a test for the nitrate group. From the reasoning above (that is, that all nitrates are soluble) one would not expect to get a precipitate when testing for a nitrate. However, if a colored solution can be obtained, it will serve just as well.

If a solution of ferrous sulfate ($FeSO_4$) is added to a solution containing the nitrate radical and then concentrated sulfuric acid is added so that two layers of solutions appear, a dark brown ring will form between the ferrous sulfate solution and the sulfuric acid solution. This test is very delicate and the student may not have success in obtaining it the first time. The brown product is generally given the formula $FeSO_4.NO$. If on the addition of dilute sulfuric acid to the solution, red brown oxides of nitrogen escape, the material in solution is a nitrite (NO_2) and not a nitrate (NO_3).

Nitrogen can be made to combine with hydrogen as has been seen before. This can be converted into ammonium salts or oxidized to nitric acid. The latter can be used to produce nitrates. Some of these processes shall be mentioned.

Calcium carbide can be made by heating coke with lime in an electric furnace. Now if nitrogen is passed over this carbide at about 1100 degrees C., cyanimide is formed which can be treated with steam under pressure to yield ammonia. The reactions are as follows:

$$CaCO_3 = CaO + CO_2$$

$$3C + CaO = CaC_2 + CO$$

$$CaC_2 + N_2 = CaCN_2 + C$$

$$CaCN_2 + H_2O = CaCO_3 + 2NH_3$$

This is known as the cyanamide process.

If air, which contains oxygen and nitrogen, is passed through a large electric arc approximately 1 per cent of the air at 3000-3500 degrees C. is converted into nitric oxide (NO). If this is cooled nitrogen dioxide (NO_2) is formed. If NO_2 is bubbled through water, nitric acid is produced. This can be represented as follows:

(1) $N_2 + O_2 = 2NO$

(2) $2NO + O_2 = 2NO_2$

(3) $H_2O + 3NO_2 = 2HNO_3 + NO$

The gaseous material must be cooled quickly in order that the nitrogen compounds formed do not decompose. This is known as the direct process.

There are several oxides of nitrogen known. These are nitrous oxide (N_2O), nitric oxide (NO), nitrogen dioxide (NO_2), nitrogen trioxide (N_2O_3), and nitrogen pentoxide (N_2O_5). The last two are unstable compounds and are not of commercial importance. Nitric oxide is a colorless gas slightly soluble in water. It can be prepared by the action of

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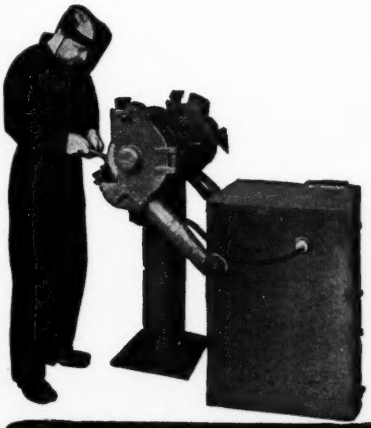

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nitric acid on copper.

$$8HNO_3 + 3Cu = 2NO + 3Cu(NO_3)_2 + 4H_2O$$

In making nitric oxide in the laboratory it will be noted that a red brown gas first appears and after this material is removed a colorless gas is produced. This is explained by the fact that the nitric oxide unites with the oxygen in the air to produce nitrogen dioxide.

$$2NO + O_2 = 2NO_2$$

After all the oxygen has been removed no more nitrogen dioxide is formed. Therefore, the red brown color disappears.

Nitrogen dioxide may be prepared by heating the nitrate of any heavy metal, thus:

$$2Hg(NO_3)_2 = 2HgO + O_2 + 4NO_2$$

It can also be prepared by the reaction of concentrated nitric acid on copper.

$$4HNO_3 + Cu = Cu(NO_3)_2 + 2H_2O + 2NO_2$$

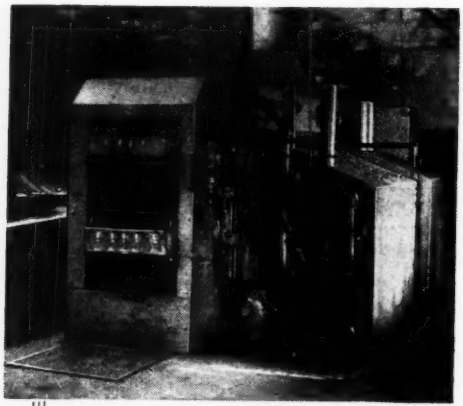
It will be noted at this point that dilute nitric acid reacting on copper produces nitric oxide, while concentrated nitric acid gives nitrogen dioxide. If the temperature of nitric dioxide is lowered to 20 degrees a colorless product is formed which is nitrogen tetroxide (N_2O_4). This will pass completely back into nitrogen dioxide at 154 degrees C. If the temperature is raised above 620 degrees C. the nitrogen dioxide will decompose into nitric oxide and oxygen. Thus:

$$\underbrace{N_2O_4}_{\text{Colorless}} \rightleftharpoons \underbrace{2NO_2}_{\text{Brown}} \rightleftharpoons \underbrace{2NO}_{\text{Colorless}} + O2$$

It can be seen for each temperature there is a definite ratio between the products formed. Nitrogen dioxide unites with water to form nitric acid.

$$H_2O + 2NO_2 = HNO_3 + HNO_2$$

Priestly prepared nitrous oxide (N_2O) in 1772 by reducing nitric oxide with moist iron filings. For many years it was thought to be a poison-



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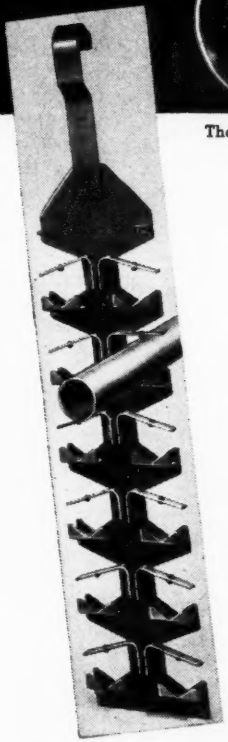

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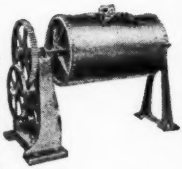

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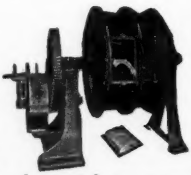

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ous material but later proved to be non-poisonous and to act as an anesthetic. When a person breathes in amounts of this gas he has a tendency to laugh; therefore, the name "laughing gas" has been applied to it. This is used quite a bit by the dentists when extracting teeth. It can be made by heating ammonium nitrate, but care must be taken that this salt is not heated to too high a temperature, as it may explode with terrific violence. Thus:

$$NH_4NO_3 = 2H_2O + N_2O$$

If a mixture of nitric oxide and nitrogen dioxide is cooled to —21 degrees C. a blue liquid appears which is nitrogen trioxide. This will decompose, of course, if the temperature is raised.

$$NO_2 + NO = N_2O_3$$

Nitrogen pentoxide (N_2O_5) is the anhydride of nitric acid and can be prepared by removing water from nitric acid, thus producing a white solid, which is nitrogen pentoxide.

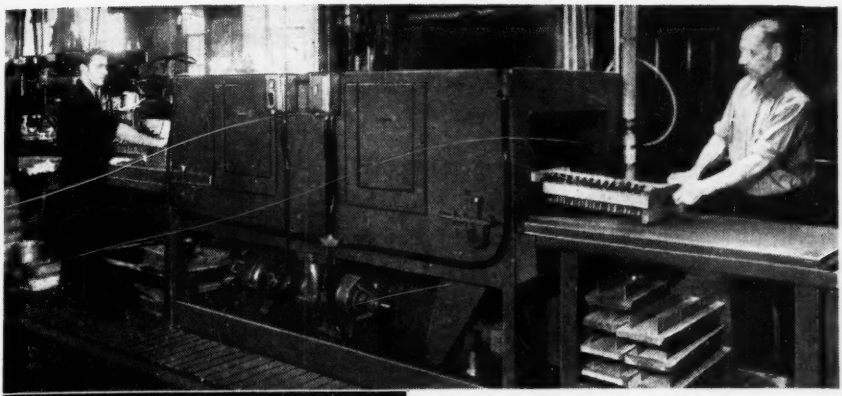
$$2HNO_3 = H_2O + N_2O_5$$

(Part 8 will be published in our May issue.)

Paper Clip Mask Is Time Saver

Suggested by Andrew Kocis, a methods man at General Electric's Schenectady Works, this simple adaptation of a

paper clip for a mask saves considerable time in spray painting operations. The two masking pieces are soldered to the clip, and overlap when allowed to come together.



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The big tank holds 180 gallons of solution or, divided, 90 gallons each of solution and rinse. The powerful pump sends 500 gallons a minute through six sets of spray tubes at 6-pound pressure – under and over the parts to be cleaned. Conveyors provided can be suited to type of work and conveyor drive is independent of pump. Tank, chip trays, and tubes easily accessible for cleaning and inspection. Vapor removal ducts if desired.

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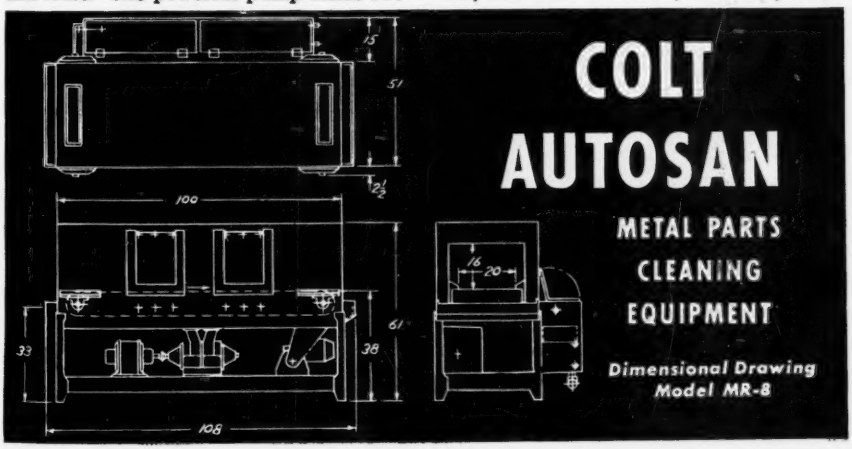


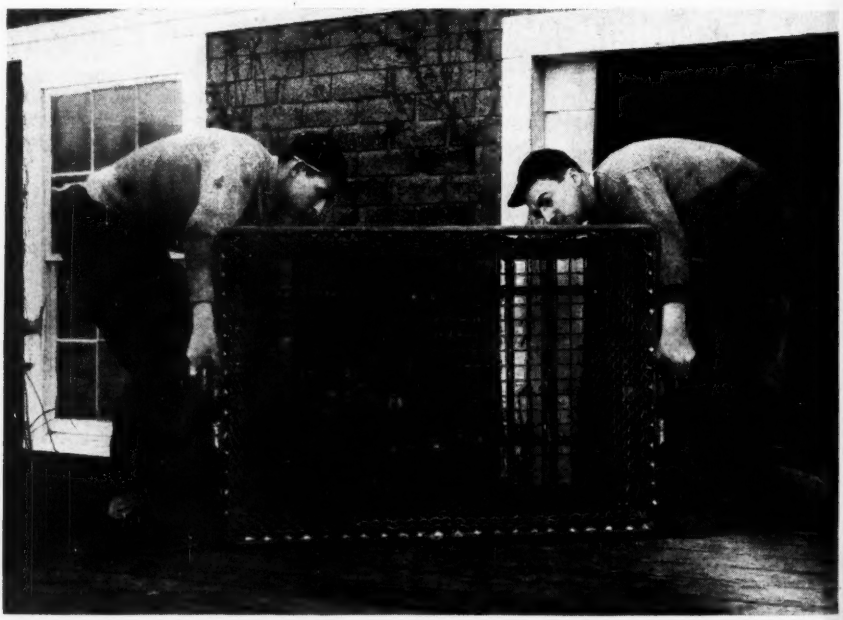
Equipment for Pickling

By JOHN E. HYLER

EQUIPMENT that is used in connection with pickling must necessarily be designed to withstand rigorous conditions, and the high production demands being made on such equipment at the present time make the service it must render even more severe.

In order to meet some of these more recent demands, new types of pickling machines of rotary design have been placed on the market. Heat treated parts, forgings and similar work are pickled, drained and rinsed in the same unit in some instances. Special machines of this kind were originally designed for pickling brass shell cases, and were later adapted and used for the handling and pickling of steel shell cases.

One of the leading manufacturers of blower and exhaust equipment has developed a line of pickling units consisting of lead and rubber-lined steel tanks, which are made complete with vent hoods, ducts, and motor-driven



(Illustration courtesy The International Nickel Company, Inc.)

This "jumbo" size pickling basket weighs 400 pounds and has a load capacity of two tons. It was designed for use in the annealing and pickling of large shell cases.

Aspirin will not relieve this headache

Many manufacturers of highly finished steel parts have a rust problem, more pronounced in humid weather, but ever present. Parts are found to rust between operations; rusty fingerprints develop overnight.

Du-Lite Proctoil has been used successfully in relieving this headache.

Proctoil was developed originally as a final dip after Du-Lite processing, in place of soluble oil. Now, it is also generally used as a rust preventive.

Proctoil is a water displacing oil. Wet work may be dipped in it and only an oil film will remain. It gets under the moisture on the parts and forms a protective coating. Used cold it may be applied by wiping, dipping, or spraying. Inexpensive to use, too.

Write for more information about Proctoil, and if you are not familiar with Du-Lite Black Oxide Finish for steel, or Du-Lite ZN Finish for zinc, ask about these also.

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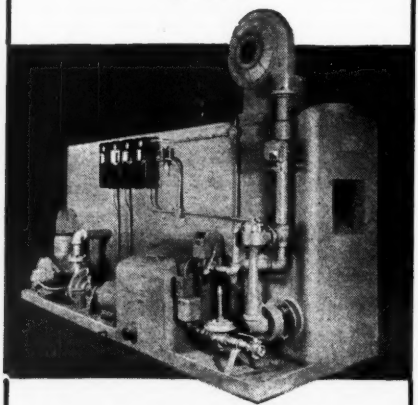

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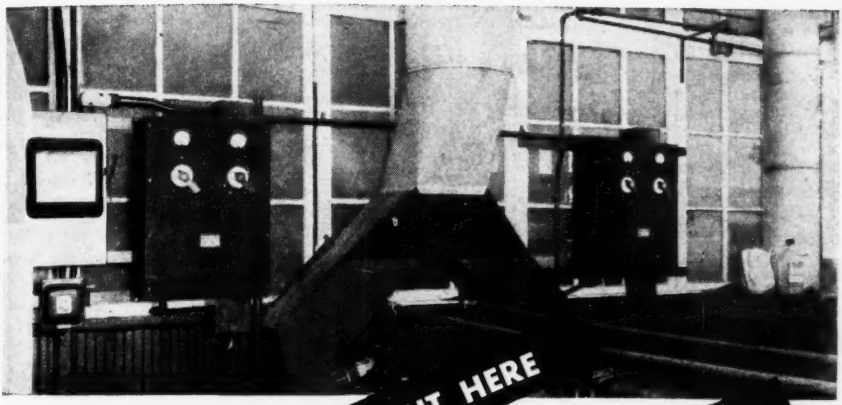
exhausters. They also furnish baskets, buckets, crates, tubs and racks of brass, copper, aluminum, Durimet, Monel and other special metals. For pickling small stampings and similar work, perforated pickling baskets made of a special aluminum-bronze alloy are available.

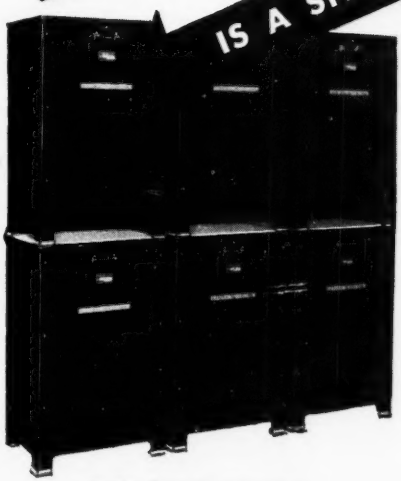
An examination of the range of special baskets that have been made available for pickling purposes reveals some interesting data. Shown in the accompanying illustration is a special basket made of Inconel, the basket weighing 400 pounds and having a load capacity of two tons. This basket was designed by Rolock Incorporated for use in the annealing and pickling of large brass shell cases. The annealing, quenching and pickling operations take place while the load of shells is in the basket.

The annealing cycle sometimes involves as high a temperature as 1200 degrees F. for a period of two and one-half hours. When withdrawn from the furnace, the basket and its load go immediately into a cold water quench and then into the pickling solution. The latter contains 10 per cent sulfuric acid and about 2.5 per cent copper sulfate within a temperature range of 160-180 degrees F. It is said that some of these baskets have withstood 1800 hours of heat, and one has carried more than one million pounds of work through the cycle. The basket is of all-welded construction, and is made of Inconel rods ranging in size from ⅝ to 1¼-inch diameter.

Torit Dust Collectors — self-contained units for carrying away dust-laden air around grinding, cutting and polishing wheels—are treated in a 16-page catalog now being issued by the Torit Mfg. Co., 314 Walnut St., St. Paul 2, Minn. The catalog describes and illustrates the various types of collectors available, together with typical installations. Also shown are dust separators, blowers, exhausters, accessories for installing Torit dust collectors, and so on.



TO VARY D-C OUTPUT HERE IS A SNAP FOR G-E RECTIFIERS



NO OTHER means of converting A-c to D-c for electroplating is as versatile . . . *as flexible in variety of D-c output at the tank* . . . as G-E Copper-Oxide Rectifiers. Examples: These six units can be regulated to give 0 to 1500 amps at 1 to 6 volts to each of two tanks shown; or any combination of capacity up to 3000 amps at 6 volts to one tank; or each unit may be used on separate jobs; or four may serve one job while two serve elsewhere; or any number of other combinations to meet changing D-c needs. For complete details: Section A-443-70, Tungar and Metallic Rectifier Div., General Electric Co., Bridgeport, Conn.

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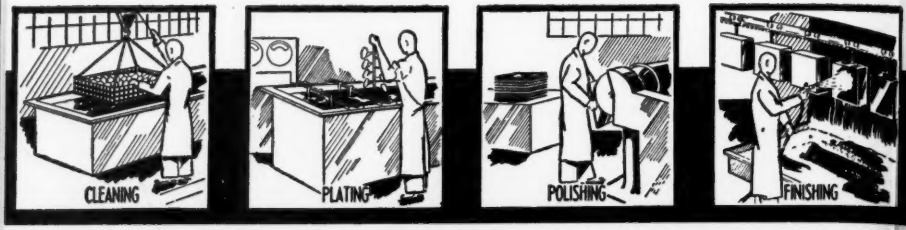
Hear the General Electric radio programs: The "G-E All-girl Orchestra" Sunday 10 p.m. EWT, NBC—"The World Today" news, every weekday 6:45 p.m. EWT, CBS.



News of the Industry

Gerald Lux Joins Oakite

In connection with its extension program to provide still further service to the metal-working industry, Oakite Products, Inc., 20 Thames St., New York 6, N. Y., announces the appointment of Gerald A. Lux to its technical staff. He

Gerald A. Lux

will make his headquarters in New York.

For two years a research associate of the American Electroplaters' Society at the National Bureau of Standards and with many years' experience as a development engineer, chemist and research director in connection with metallurgical and chemical problems involving the use of alkaline and related cleaning compounds, Mr. Lux will devote a large part of his time to field work in an advisory capacity on special problems and developments. In addition, he will conduct research studies on metal surface preparation and finishes in Oakite's research laboratories.

Hotel Reservations for A.E.S. Conference

Now is the time to get a priority on hotel accommodations for the Annual Conference of the American Electroplaters' Society to be held at the Hotel Cleveland, Cleveland, Ohio, on June 12, 13 and 14.

The Committee on Hotel Reservations has found it advisable for individuals to make their reservations direct with the hotel management in order to prevent any errors through indirect handling. Be sure to receive a written acknowledgment for your space, save it and be prepared to present it when registering at the Hotel Cleveland as it will be your identification for the space reserved.

All members of the American Electroplaters' Society can obtain reservation blanks from their respective branch secretaries who will be provided with a supply. Rates at the Hotel Cleveland begin at $3.25 up to $6.00 for single rooms; double rooms may be had from $4.50 to $8.00. Other hotels in the vicinity are the Hotels Carter, Hollenden and Statler.

Roberts Rouge Laboratory

The Roberts Rouge Company, Stratford, Conn., has announced that a physical and chemical laboratory has been established at the plant with modern

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and latest equipment installed. The laboratory will serve a two-fold purpose; first, in the control of raw material purchased and, second, in the development of new compounds and the control of manufacturing processes. While extreme care has always been exercised in the production of compounds, this important feature will be stressed even more rigidly with the added technical control.

The laboratory will be under the supervision of H. T. Leavenworth, metallurgist and industrial chemist, well known locally through his connection with the Bridgeport Testing Laboratory which he established and operated successfully for a number of years. The facilities of the new laboratory are freely extended to all customers of the company.

Dr. Schweng Joins Turco

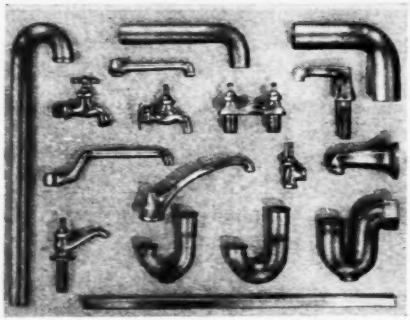
Wartime changes in procedures and materials, requiring constant revision of cleaning and processing methods in the metals and machinery industry, resulted in the appointment of Dr. John M. Schweng to the staff of Turco Products, Inc., Los Angeles, Calif., according to an announcement made by S. G. Thornbury, president and technical director. Dr. Schweng will serve as chemical research engineer and director of bacteriological research.

He was chemical research engineer at

Dr. John M. Schweng

Lockheed for two and one-half years, and before that was chief chemist at Imperial Laboratories in Los Angeles

Packer-Matic



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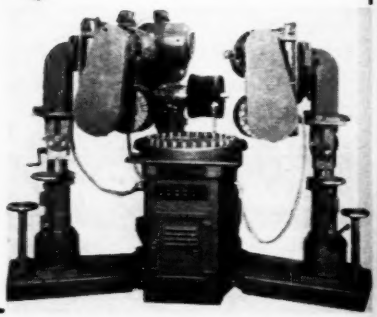

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for three years. Dr. Schweng has to his credit advances in the catalytic cracking of petroleum crude, and in the development of protective coatings for aluminum and magnesium alloys. A member of the American Chemical Society, Dr. Schweng took his M.D. degree at the University of Chicago, from which university he also received a B.S. degree in chemistry.

New England A.E.S. Regional Meeting

The Sixth Annual New England Regional Meeting of the American Electroplaters' Society will be held in New Haven, Conn., on Saturday, April 22. Beginning at 2:00 p.m., the educational session will be held in Strathcona Hall of Yale University. The banquet and dance will start at 7:00 p.m. in the ball room of the Hotel Taft. The women's program includes the matinee performance at the Shubert Theater.

Appointments at Carborundum

Charles Knupfer, vice president in charge of sales of The Carborundum Company, Niagara Falls, N. Y., announces the appointment of Charles W. Sprenger as district manager for the metropolitan New York district. Mr. Sprenger succeeds the late John Storm. His headquarters will be at The Carborundum Company's New York warehouse and sales office located at 601 W. 26th St., Starrett-Lehigh Building.

Mr. Sprenger was first employed in the New York branch office in a clerical capacity and later was appointed to the sales staff as sales representative, calling on the hardware trade in the New York area. Soon after he was made general industrial sales representative. He assumes his new duties with a fine background and long experience in the abrasive field.

Announcement is also made by Mr. Knupfer of the appointment of Joseph C. Steele as district sales office manager at New York. He succeeds E. W. Martin, who has been named as regional sales office manager of the Eastern sales districts of The Carborundum Company.

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All of the great variety of small parts you see in this picture were deburred mechanically, in quantity, by the Roto-Finish process. This revolutionary new method of mechanical finishing is used with equal success on steel, brass, aluminum, stainless and nickel steel parts . . . on castings up to 75 pounds, as well as the tiny, delicate, threaded parts shown here.

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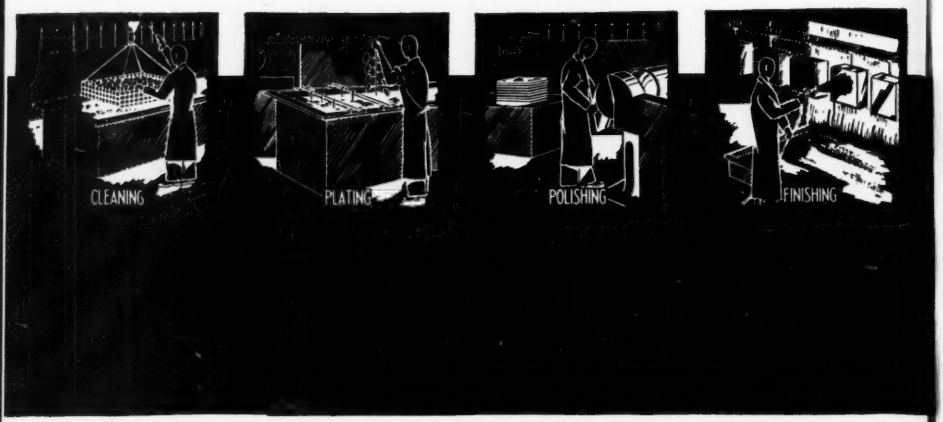
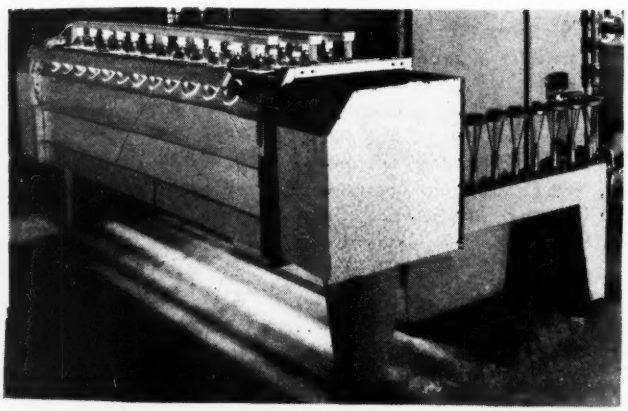


Infra-Red Equipment

As a pioneer in the field of infra-red radiant heating, the C. M. Hall Lamp Co., 1025 Hancock Ave., Detroit 7, Mich., offers a line of completely enclosed oven equipment. According to the manufacturer, these ovens permit full use of heat—both radiant and convected—which they claim allows perfectly balanced temperatures and makes it possible to control temperatures once they are attained. These enclosed ovens are adaptable to positive ventilation control by the use of recirculating or exhaust systems.

As an industrial tool, infra-red radiant heating made its initial appearance some years ago, and today is widely used in the field of paint and finish drying. The Hall completely enclosed oven is the product of a company which claims 33 years of experience as a manufacturer of lamp equipment. Other noteworthy features of Hall ovens are claimed to be—speed in drying, baking or curing of finishes, and flexibility to a wide range of production items. Ovens can be installed in multiples of five or nine feet or any combination of these lengths.

An attractive 28-page booklet entitled "Infra-Red at Work," describing many applications of infra-red heating, is available on request to the C. M. Hall Lamp Co.



Hall Infra-Red Oven

KeWax

Kelite Products Inc., 909 E. 60th St., Los Angeles, Calif., reports that a satiny finish on zinc or cadmium-plated surfaces can be achieved by a quick dip in a dilute solution of hot KeWax immediately after plating. This operation, developed by a Kelite service engineer in

cooperation with the Metal Finishing Company, Los Angeles, Calif., is said to have proved highly successful in finishing tools for the Navy.

Sodium Carboxy-Methyl-Cellulose

Hercules Powder Company, Cellulose Products Department, Wilmington, Del., has introduced sodium carboxy-methyl-cellulose, a cellulose derivative which is soluble in water. Experimental research is being conducted to determine the suitability of the material in the manufacture of emulsions, paints, textiles, oil and other industries.

Now in small-scale production, the chemical is available in experimental quantities only. Properties of sodium carboxy-methyl-cellulose make it a stabilizer and emulsifying agent.

It is expected that the material will prove useful where hydrophilic colloids possessing marked suspending, thickening, stabilizing and film-forming properties are required. Some of its possible applications are to thicken textile printing pastes, to emulsify emulsion paints and lacquers, and to provide a protective colloid for oil-in-water emulsions.

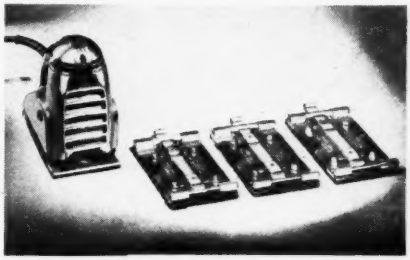
Its film-forming properties are said to make it useful in coatings, particularly for those of the greaseproof type. Other uses for the water-soluble colloid are in the manufacture of boiler compounds, creaming latex, oil drilling muds, ceramics, can-sealing compounds, anti-stick compounds, leather finishes and many other industries.

Sodium carboxy - methyl - cellulose is supplied as a white granular powder, odorless, tasteless and readily soluble or dispersible in water. Very discous, stable aqueous solutions can be obtained with it. Aqueous solutions can be evaporated, leaving colorless, tough, transparent films which are unaffected by the common organic solvents, oils, fats and greases. Some salts and acids react with sodium carboxy-methyl-cellulose, producing films insoluble in water.

Sterling Detachable Sanding Pad

An outstanding feature of the Sterling 1000 Electric Portable Sander is the flexible sanding pad which can be detached from the machine by simply pulling out a latch. Several pads loaded with abrasives can be kept near work for quick exchange. When different grades of abrasives are used on a job, additional pads loaded with coarse and fine grits can be switched when necessary, thus avoiding the necessity of the operator to stop work and reload.

The Sterling Sander is specially designed to cover the entire range of abrading from coarse sanding to lapping and finishing. It is said to provide fast, precise, uniform cutting on metal, wood and plastic. The sanding pad is flexible and will conform to convex or concave surfaces of moderate curvature. Special pads for unusual contour sanding or rubbing are also available. The tumbler-action locks on the sanding pad can be easily operated by a key that is furnished with the machine or by a screwdriver. As the tumblers are turned to lockup position, they draw in the slack, pulling the abrasive taut on the pad. The tumblers operate with only about one-quarter turn and lock the abrasive securely in position.

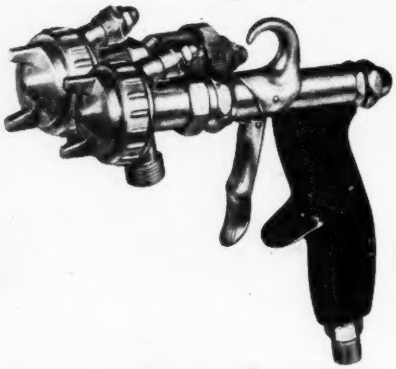


Sterling Sander and Detachable Pads

Another feature of importance is the non-vibrating action of the Sterling 1000 while the sanding pad is moving at a speed of 4,500 oscillations per minute. The sander is a product of Sterling Tool Products Company, 358 E. Ohio St., Chicago 11, Illinois.

Paasche Multi-Fluid Airbrush

Mixing two or more materials in the air as they are applied to the surface being coated is the unique feature of the Paasche Multi-Fluid Airbrush, Type F1020, product of Paasche Airbrush Co., 1910 Diversey Parkway, Chicago 14, Ill. One of the principal uses of the gun is the spraying of latex and ascetic acid, mixing the two fluids in the air as they are being applied. For the application of latex the airbrush is equipped with stainless steel-lined fluid bodies, stain-



Paasche Multi-Fluid Airbrush

less steel tips and needles. The airbrush is also used for applying two or more colors together to produce unusual blended effects.

The illustration shows a Multi-Fluid Airbrush with two fluid bodies. The needle valve of the special fluid assembly connected to the main body of the airbrush is actuated by a piston in an air cylinder; thus simultaneous operation is effected by pulling the one easy-action trigger. The airbrush is also supplied for three-color or material application.

Each spray pattern is controlled individually from small round to wide fan by a calibrated adjustment. The position of one fluid assembly is adjustable so the spray patterns can be made to converge and the materials mixed in the air—or the materials may be applied separately to produce two-tone effects when different colors are used.

Curran Alkyl Aromatic Solvent

The Curran Corporation, Dowling Building, Malden, Mass., announces the development of an alkyl aromatic solvent concentrate, which is non-inflammable and non-combustible. It has no low volatiles and forms sparkling clear solutions with water. The aqueous solutions are said to be completely stable at elevated temperatures, and effective tests have been made on the power of the solvent to inhibit rusting of the parts cleaned. The solvent is processed from non-war-scarce chemicals.

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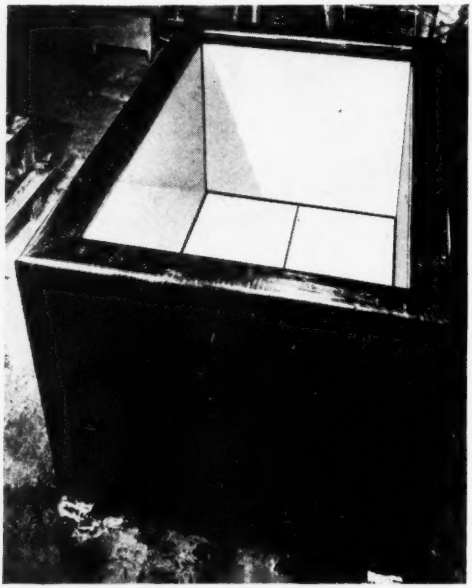
Pittsburgh Glass Tanks

One of the most important advances in the glass industry has been the recent development by Pittsburgh Plate Glass Company, 632 Duquesne Way, Pittsburgh, Pa., of glass tanks or vats for industrial use. A number of industries have turned to glass for their tanks, and the installation of new tanks and the relining of existent units with glass has increased rapidly. The glass used for these tanks is tempered and strengthened, making for permanency.



This tank, which has been lined with Carrara structural glass, is used for pickling steel wire. The chemical used is sulfuric acid.

Glass tanks are made strong enough and resistant to quick temperature changes by a special tempering process which assures tanks that are permanent. Glass tanks can be fashioned in many shapes and sizes, and the glass is impervious to acids, alkalis, chemicals and liquids of almost any type. Glass tanks are of high tensile and compressive strength, and are said not to rot. They are also non-absorptive and non-porous, and present a hard, level, sanitary surface requiring practically no maintenance. Standard Pittsburgh glass tanks are built of opaque Carrara structural glass or of clear plate glass where transparency is desirable.

The tanks are manufactured complete at the factory, but if new linings are required for existing tanks, crews of Pittsburgh installers are prepared to move into plants for the relining of tanks previously utilizing copper, rubber or other materials now curtailed by war demands.

Glidden Masking Compound

A tinted masking compound recently developed by The Glidden Company is said to solve the annoying and slow process of removing a baked insulating varnish from certain motor parts on which no finish should finally appear.

The masking compound, according to the manufacturer, can be applied by brush to the parts that are to be strip-

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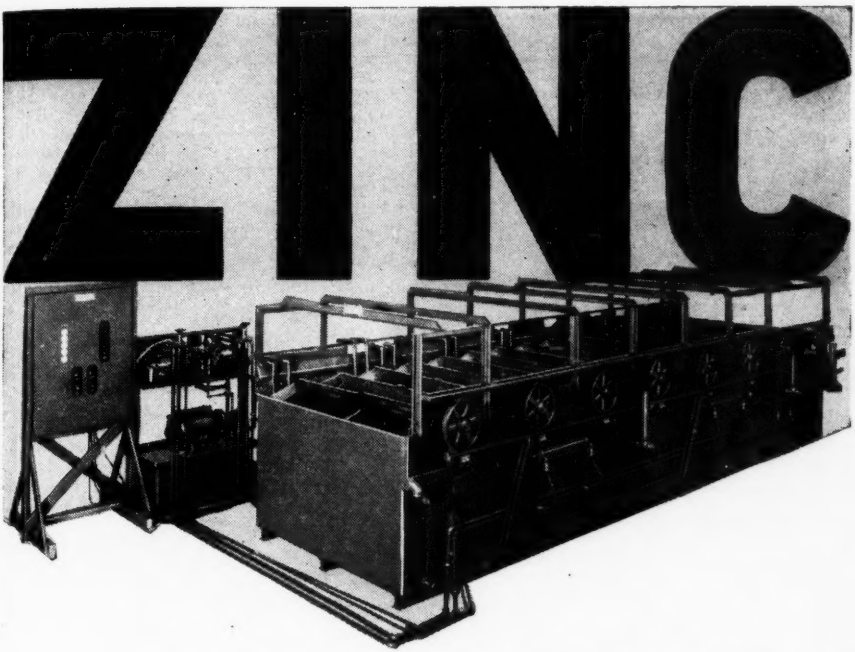

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We have the process, nationally known for its efficiency and performance; the equipment, for both plating and dichromating; and the supplies, from chemicals to the efficient ball anode which is an exclusive Udylite development.

The above automatic dichromating machine is a Udylite development for the processing of large quantities of small parts through the complete cycle, from initial rinse to ultimate heat treat. The machine is capable of handling approximately 10 cu. ft. of volume per hour, with excellent uniformity and a minimum of scarring.

Investigate "Zinc by Udylite"—your inquiry will receive our prompt attention.

THE UDYLITE CORPORATION

1651 E. Grand Blvd., Detroit 11, Mich.

Chicago 12
1943 Walnut Street

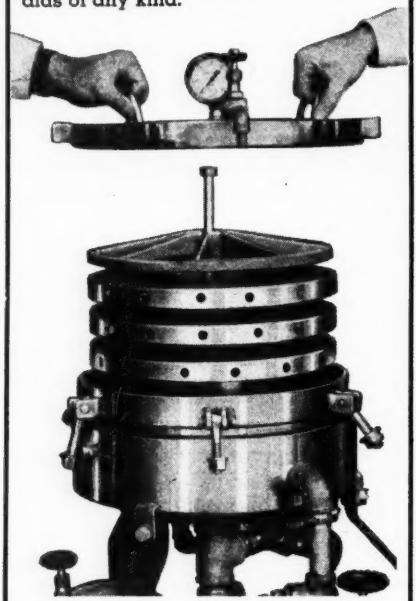
Long Island City 1, N. Y.
11-16 44th Drive

Cleveland 3
4408 Carnegie Ave.

Easy to Operate

Yes-Sparkler production filters

are built for practical operation—one complete, portable air-tight unit that can be quickly and easily dis-assembled for cleaning and replacing filter aids of any kind.



Sparkler Filters purify any fluid of suspended matter, in any quantity, using any filter aid that produces the finest results at greatest speed.

Write for Catalog for your specific use.

SPARKLER MFG. COMPANY
254 Lake St.
Mundelein, Ill.

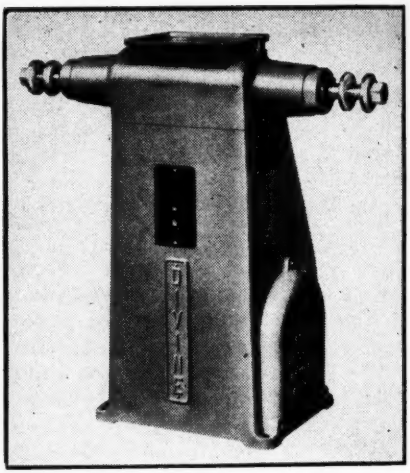
SPARKLER HORIZONTAL PLATE FILTERS

ped. It dries in 10 minutes, ready to dip into the insulating varnish. After baking the insulating varnish for eight hours at 250 deg. F., the film over the masking compound can be easily cut and stripped down to the metal. Such a masking compound is said to be particularly adaptable to the manufacture of motors when the problem of masking is involved.

A test panel will be furnished to anyone interested in this masking compound who addresses a request to The Glidden Company, Cleveland 2, Ohio.

Divine VJ Lathe

The demand for a light duty lathe for small parts polishing and burring is said to be filled by the VJ Lathe offered by Divine Brother Company, Utica 1, N. Y. The lathe is a V-belt-driven unit, with



Divine VJ Lathe

motor sizes up to 3 h.p. and spindle speed range to a top of 3,850 r.p.m. The lathe may be used with taper spindle extensions for bob work.

Two sealed-for-life spindle bearings of ample capacity eliminate the need for periodic lubrication of spindle bearings. The spindle is V-belt driven from a NEMA standard motor. An adjustable motor base provides V-belt adjustment. The starter is of the mechanical push-button type with thermal overload relays for motor protection.

ANNUAL CONFERENCE

American Electroplaters' Society

• • •

JUNE 12, 13, 14

HOTEL CLEVELAND

CLEVELAND

MOST VITAL EVENT THIS YEAR

Annual Conference on

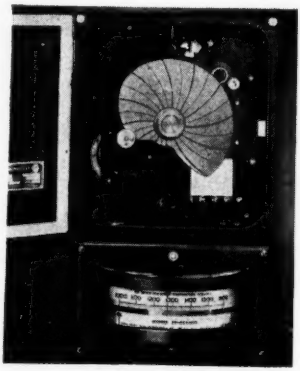
METAL FINISHING *and* ELECTRODEPOSITION

The roomy composition tray and spring return, spindle lock pin are standard equipment. The straight front, cast base assures rigidity of bearing mounting. Louvers in the rear doors provide motor ventilation.

The spindle length overall is 44 in. for wheels up to 2-in. wide. The standard spindle diameter is 1¼ in., with 4-in. flanges machined all over, and bronze spindle nuts. Optional extras include longer spindle, two-speed drive and magnetic starter controlled by stop-start lever brake.

Wheelco Chronotrols

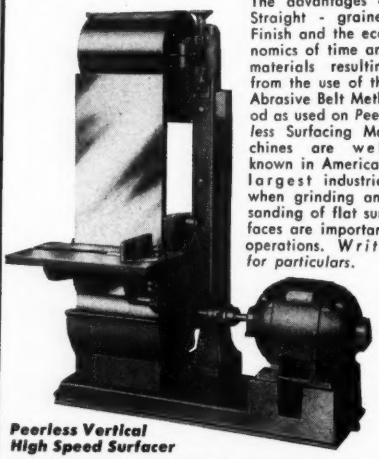
A line of instruments to enforce any desired heating or cooling program has been announced by Wheelco Instruments Company, Harrison and Peoria Sts., Chicago 7, Ill., Named Chronotrols, the instruments are built around the company's line of pyrometers, potentiometers, termometers and resistance thermometers, all of which employ an electronic principle of effecting temperature control. They provide completely automatic temperature regulation, regardless of the changes in temperature desired for a given process or application. The temperature cycle desired is cut on a disc, and its rotation by a synchronous motor moves the temperature-setting lever of the control instrument.



Wheelco Chronotrol

Chronotrols are offered in 25 models, including 10 for proportioning control and others for two-position on-off and three-position on-intermediate-off control

Eliminate Hand Sanding
Speed-Up Production



The advantages of Straight - grained Finish and the economics of time and materials resulting from the use of the Abrasive Belt Method as used on Peerless Surfacing Machines are well known in America's largest industries when grinding and sanding of flat surfaces are important operations. *Write for particulars.*

Peerless Vertical
High Speed Surfacer
PRODUCTION MACHINE CO., Greenfield, Mass.

SOLVE YOUR SPEED-UP PROBLEM WITH A

Write for full information about this sensational new method of finishing or deburring delicate parts by tumbling.

LUPOMATIC TUMBLING MACHINE CO., INC.
4510 BULLARD AVE. BRONX, N. Y.

Are You Properly Emphasizing the *Savings Feature* of Your Plant's Payroll Savings Plan?

Now's the time to emphasize over and over again the *savings* feature of your Payroll Savings Plan. To press home to your people the need of building up savings—building them up not only in wartime but also in the years after the war. To point out that a bond cashed before its full maturity is a bond killed before giving full service to its owner—*or his country!*

Buying War Bonds, holding War Bonds, and keeping wartime savings mounting—all are vital. But no one of these is enough by itself. The *savings habit* must be carried over into the years which follow the war. For if, at war's end, we have 'flash-in-the-pan' spending, *everybody loses.* The spender loses, you lose, and the country loses! While a working public, convinced of the value of continued, planned savings is the soundest possible foundation for private enterprise of every sort.

WAR BONDS TO HAVE AND TO HOLD!

★ LET'S ALL BACK
★ THE ATTACK . . .
★ WITH WAR BONDS!

The Treasury Department acknowledges with appreciation the publication of this message by

PRODUCTS FINISHING

This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council

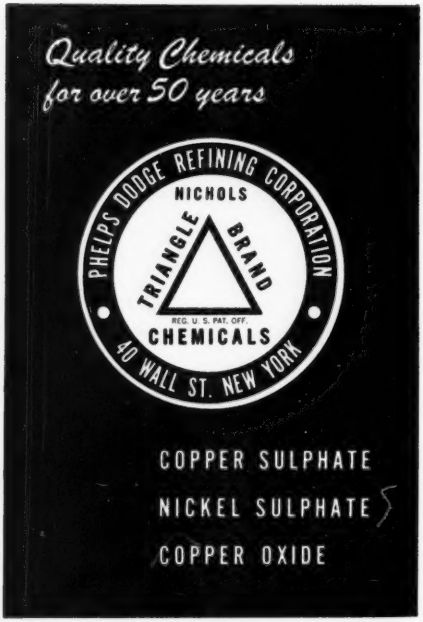
for high- and low-temperature applications. Thermometer models are available in recording as well as indicating types.

Absence of mechanical linkage between the measuring and control sections of Wheelco Chronotrols makes possible instant response of the instrument's control unit to changes in temperature noted by its sensing unit. The frequency of oscillating current flowing between pick-up coils, mounted on the temperature control setting index, is changed when a control flag mounted on the pointer or pen arm is moved between the coils by a temperature rise, or is moved from between the coils by a temperature drop. This frequency change in the control circuit governs the output current of a vacuum tube, acting to open relay contacts which, in turn, operate fuel valves or switches.

Willson MonoGoggle

An all-plastic single-lens goggle, known as the Willson MonoGoggle, has been placed on the market by Willson Products, Inc., Reading, Pa. It is designed to provide high impact strength, unobstructed vision and a high degree of comfort. Weighing only 1¼ ounces, the streamlined MonoGoggle has a replaceable, non-shatterable crystal-clear plastic lens and can be worn comfortably over any prescription glasses.

Willson MonoGoggle



Cres-Lite

Crescent Bronze Powder Company, 116 W. Illinois St., Chicago 10, Ill., announces the availability for WPB permitted uses of a ready-mixed aluminum paint which is sold under the trade name "Cres-Lite."

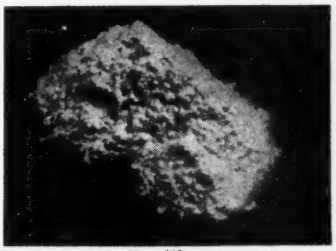
Cres-Lite Synchrome Aluminum Paint can be applied with both spray or brush and is said to be self-leveling with no brush marks. It is heat-resisting and will dry in six hours.

According to the manufacturer, one coat of Cres-Lite will completely cover metal and other materials to give a finish that closely resembles that of chrome plate. The paint is made in several grades to meet the requirements of different users.

Compar Transparent Solvent-Proof Tubing

Solvent-proof, rubber-like transparent tubing, made of compar, a special type of vinyl resin developed by Resistoflex Corporation, Belleville, N. J., is finding a number of new uses in aircraft and other industries.

"The answer to numerous industrial problems is found in . . .



FLOCK

Rayco Flock is textile fibres cut to extremely short uniform lengths, applied by adhesive to form a solid, even coating. Available in various lengths, styles, and colors.

FUNCTIONAL

Used in airplane, auto and numerous other industries for—

SOUND DEADENING • TEMPERATURE INSULATION • INTEGRAL GASKETS • SHOCK-ABSORBING SURFACE • NON-MAR SURFACE PROTECTION.

DECORATIVE

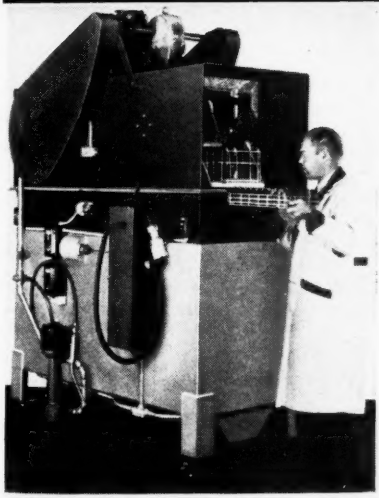
Applied in various lengths and colors to wood, paper, cloth, metal, etc., the following effects are produced:

SUEDE LEATHER • FURNITURE UPHOLSTERY FABRICS • AIRPLANE AND AUTO UPHOLSTERY FABRICS • VELVET • VELOUR • MOHAIR.

REQUEST SAMPLES AND PRICES

RAYON PROCESSING CO. OF R. I., INC. • 65 TREMONT STREET CENTRAL FALLS, R. I.

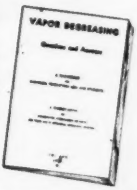
Improved Vapor Degreasing



Speeds Up Work 1/3
Absolutely Non-Inflammable

Phillips' PHILLSOLV vapor degreasing solvent is tops for efficiency. It cuts vapor degreasing time by one third! Low toxicity—higher safety factor. PHILLSOLV, non-water soluble, has many applications in instrument and war plants. No corrosive action. Write for catalog on PHILLSOLV and complete line of electrical vapor degreasing machines.

FREE DEGREASING MANUAL



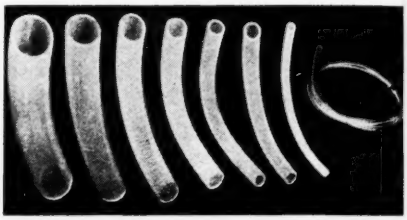
Contains specific information on degreasing problems, solvents, solvent toxicity and control, solvent recovery, and many practical applications.

SEND FOR COPY TODAY.

PHILLIPS MFG. CO., 3494 W. Touhy Ave., Chicago, Ill.

In laboratory use its transparency permits constant inspection of the contents. Because the tubing is tough, strong and completely inert to almost all organic solvents, it is highly useful for low-pressure, room-temperature handling of these hard-to-handle materials. It is not affected by even such active solvents as carbon disulphide, carbon tetrachloride, trichlorethylene, perchlorethylene, acetylene tetrachloride, benzol and toluol, or by oils and fuels such as high octane gasoline with the highest aromatic content, which are used in ordnance and aircraft work.

Having low permeability to gases and being unaffected by such gases as freon,



Compar Transparent Solvent-Proof Tubing

methylchloride, methyl bromide, phosgene, and so on, further applications are immediately apparent. When used on Bunsen burners or other laboratory appliances, the tubing does not absorb the protective odors with which illuminating gases are usually loaded and, therefore, prevents the laboratory atmosphere from being contaminated by them.

One of the many interesting applications which has been developed recently and for which transparent compar tubing has been used with success in the aircraft industry is as temporary instrument lines for test flights. Another application for which the tubing has proved well adapted is as a cover for the conveyor hooks passing through the degreasing operation.

"Pennsalt FA 42"

Fluoboric acid, HBF_4, is now being offered by the Special Chemicals Division, Pennsylvania Salt Manufacturing Company, 1000 Widener Bldg., Philadelpia 7, Pa., under the trade name "Pennsalt FA 42," as a 42 per cent solution

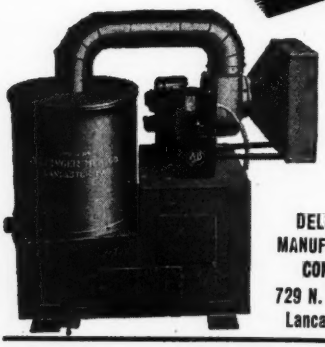
SOL-KLEAN
for
Better Paint
Adhesion
INDUSTRIAL CHEMICAL PRODUCTS CO.
DETROIT 7
Milwaukee **Fort Wayne**

One Worker Can Operate It!

Keep your production rate up in spite of manpower shortage . . . with a Kreider Centrifugal Dryer. This sturdy, all steel, electric welded dryer has reversing drum switch and fast-acting foot brake. V-belt driven. ¾ H.P. motor. *Available with or without heating unit.*

for QUALITY
ECONOMY
SPEED

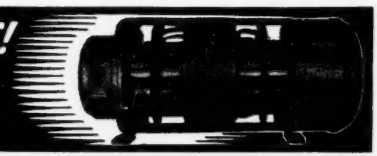
KREIDER *Centrifugal* DRYER



Write or wire for complete information and prices.

DELLINGER MANUFACTURING COMPANY
729 N. Prince St.
Lancaster, Pa.

BETTER PLATING, LESS COST!
"MGC" ELECTROPLATING EQUIPMENT
Write for Interesting Details **TODAY!**
MOTOR GENERATOR CORP., HOBART SQ. BOX M 44 TROY, OHIO



Check in
In Cleveland it's the
HOTEL HOLLENDEN
In Columbus it's the
NEIL HOUSE

DeWITT OPERATED HOTELS

OTHER DeWITT HOTELS:
THE LANCASTER Lancaster, Ohio
THE BARON STEUBEN Corning, N.Y.

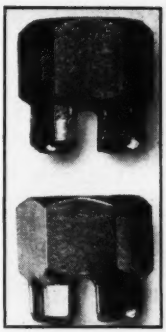
Burring Problems Solved with Roberts Compounds

Today, as never before, dependable burring compounds are needed to speed up production.

Illustration shows metal parts before and after the use of Roberts Compounds on a wire or tampico wheel. Roberts Compounds provide the following advantages:

- **A good smooth ground.**
- **Preserve all required dimensional edges on complex metal parts.**
- **Rapid and economical production.**
- **Eliminate burrs and breaking of edges.**

If you have any buffing problems, write in for samples and suggestions.



TOP, BEFORE
BOTTOM, AFTER

ROBERTS ROUGE CO.
STRATFORD • CONN.

Testing finishes simplified by Taber ABRASER

Comparative tests for adhesion, wearability and toughness of paint, lacquer, enamel, electroplate and similar finishes are accurately made from four-inch specimens. Results totalled on built-in counter in terms of wear cycles. *Write for Bulletin 2014.*

TABER INSTRUMENT CORP.
111 PF GOUNDRY ST., NORTH TONAWANDA, N. Y.
Designers and Builders of Precision and Scientific Apparatus

containing a slight excess of boric acid for stabilization. It is a clear, colorless solution having a specific gravity of 1.33.

Known also as borofluoric acid and borohydrofluoric acid, its suggested uses are in the control of acidity in fluoborate electroplating baths, preparation of various metallic fluoborates, pickling agent and preparation of catalysts for esterification, polymerization, and condensation reactions.

Trushade Process of Gold Plating

Developed by chemists of The Alrose Chemical Company, Providence, R. I., after many years of scientific and practical research, the Trushade process of gold plating introduces an industrial gold finish that can be applied quickly and economically.

The process makes use of Trushade 24 kt. gold and Trushade hard and 14 kt. alloys. The former is metallic gold suspended in an aqueous medium for use in preparing 24 kt. and alloy plating solutions. The latter are alloy metals also suspended in an aqueous medium and are for use in conjunction with Trushade 24 kt. gold in preparing alloy plating solutions.

It is claimed that Trushade eliminates the loss incurred in cutting down gold and has high efficiency. The process also allows increased flexibility of application in gold plating operations. Tests based on government specifications are said to show acid resistance up to three hours on a 70-second application. Quality and gold content of both Trushade gold and alloys are certified by Alrose.

Cleaning After Magnaflux

After Magnaflux operations a simple dip or spraying of work with Cyclodiene hydrocarbon solvent economically removes the oil and dye and leaves clean metal surfaces, according to the Technical Processes Division, Colonial Alloys Company, Colonial Philadelphia Building, Philadelphia 34, Pa., manufacturers of Cyclodiene.

Cyclodiene can be handled in ordinary open tanks or spray machines at room temperature. Toxicity is said to be negligible. Since Cyclodiene is tested neutral, and shows no signs of hydrochloric, muriatic, oxalic, nitric or sulfuric acids, or cyanides, it is claimed to be safe for use with all metals including aluminum and magnesium.

The solvent recovery rate is high; therefore, the solutions may be used over and over again. Magnafluxed parts thus cleaned are soon ready for such operations in surface finishing as rust proofing, painting or other organic or chemical finishing, electroplating or anodizing.

GET WORK OUT FASTER

with

Steel-Grip Gloves

With no time to be lost, keep war production moving, speed deliveries, save time with Steel-Grip Reinforced Gloves. They handle rough, heavy, jagged materials at breathless pace. Chrome tanned cowhide. Steel ribbon reinforced palm and fingers. Steel thread sewed. Protect against cuts, bruises. Or what's your need? Over 4300 proved Steel-Grip Safeguards may give immediate answer. Used by big industrials since 1910. Write for catalog or state your need today.

INDUSTRIAL GLOVES CO.

746 Garfield Blvd. Danville, Illinois

(In Canada: Safety Supply Co., Toronto)

FOR SALE

1—New DeVilbiss Spray Booth No. 178 Type L.X.E. with gun and gauges, floor space used 45"x62".

1—New automatic conveyorized Infra-Red dryer complete with 60 lamps, blower and conveyor mechanism, floor space used 12' x 12'.

McQUAY-NORRIS MANUFACTURING CO.
1737 Massachusetts Ave., Indianapolis 7, Ind.

CHEMIST WANTED

To assist in formulating lacquers and synthetic enamels for automotive trade. State age, military status, experience, salary.

AUTOMOTIVE FINISHES, INC.
P. O. Box 457, N. W. Station
DETROIT 4 • MICHIGAN

The JONES BACKSTAND IDLER

PAVES THE WAY TO Better, Faster Grinding

Get high-speed cutting and mirror-like finishes! Convert your grinding and polishing lathes to the fast, smooth abrasive belt method of grinding for better results with the space-saving Jones Backstand Idler. Full details in Bulletin No. 120.

Jones also makes Bench Grinders and Swing Grinders, as well as special equipment for every grinding and polishing job.

WRITE FOR BULLETIN No. 120

JONES ENGINEERING COMPANY
Dept. B-1
ELLWOOD CITY, PA.
Abrasive Belt Grinding Specialists

RUST-PROOF IT WITH SILCO

NEW VITREOUS TYPE FINISH

LOW BAKE—ONLY 350° F.
Use Your Present Ovens!

NON PRIORITY matte finish for steel and brass. Resists abrasion, mild alkalis, most acids. Inert to organic solvents. Withstands salt spray over 200 hours and heat up to 1000° F. Sprayed on, dried at 200° F., then baked in any regular industrial oven at 350° F. In black, white, Navy warm drab, Army olive drab. Used by Army and Navy.

Use SILCO in your war work—then use it in post-war production without a change! Send for test samples now.

BLACK MAGIC
ONE BATH OXIDE BLACK

For blacking and rust proofing steel in one bath at 300° F. A black bath for zinc, operating at room temperature, another for copper and brass at 210° F., and one for cadmium at 140° F., which is specified by Aircraft Industry. Much used as a "marker" to tell zinc fittings from cadmium. Kills disturbing light reflections.

Black-Magic for visual control of steel gages is a patented process No. 491534. Saves expensive checking, corrosion, tempering.

BLACK-MAGIC BLACKING SALTS for STEEL, IRON COPPER, ZINC CADMIUM
•
WITCH-DIP WITCH-OIL FINAL FINISHES
•
SILCO PROTECTIVE COATING
•
Cleaners Wetting Agents Acid Inhibitors Heat Treating Salts
•

MITCHELL-BRADFORD
CHEMICAL COMPANY
MODERN METAL FINISHES
2446D Main St., Stratford P. O., BRIDGEPORT, CONN.

Lixol. The Cowles Detergent Company, 7016 Euclid Ave., Cleveland 3, Ohio, has issued a descriptive folder on Lixol, the emulsion-type solvent cleaner manufactured by this company. Complete details are given on Lixol, which is recommended by the manufacturer for the cleaning of all metals. It can be used either hot or cold.

A handy return postcard which can be used to obtain additional information on the adaptation of Lixol to special problems is attached to the folder, copy of which may be obtained upon request.

Inter-Department Rust Preventative and Surface Conditioner. A data sheet describing and illustrating the use of Rustex No. 2 for preventing inter-department rust, test tank and cleaning tank rust has been issued by the Stuart Industrial Service, 4603 W. Roosevelt Rd., Chicago 50, Illinois.

Acidulum and Greas-Olve. A four-page folder devoted to two products of Service Industries, 2105 E. Somerset St., Philadelphia, Pa., has been issued by that firm. Acidulum, an acid-proof plastic coating, is specifically formulated for application to all kinds of metal surfaces. It is said to be definitely repellent and unaffected by a large number of acid solutions and chemicals.

Greas-Olve is a powerful liquid emulsifying and dissolving agent. When Greas-Olve is diluted with considerable proportions of water or kerosene, it is said to remove quickly carbon, grease and heavy oil deposits from concrete, wood, masonry floors. It can also be used for heavy duty degreasing of metal objects. Copy of the folder free upon request.

Check Chart. Meeting an urgent need of manufacturers engaged in postwar planning, a simple yet comprehensive "New Products Check Chart" has been developed by Designers For Industry, Inc. This Check Chart, developed around a list of 46 questions, provides a systematic plan whereby a manufacturer can quickly and soundly appraise a product which he believes might be a desirable one for his company to make. The chart also serves as an outline for a deliberate and detailed study of all the principal factors involved.

NALCO DRITHERM
CARBON FILAMENT LAMPS
Best For Infra-Red Ray Drying
Nalco Dritherm Lamps are the carbon filament type...proved for years in therapeutic and industrial practice as providing maximum emanation of infra-red ray within the desirable penetration band. Made only by—
NORTH AMERICAN ELECTRIC LAMP CO.
1020 Tyler Street St. Louis 6, Mo.

SPECIFICATIONS!
+
PLUS
Adaptation of formulae to the individual requirements of busy war contractors.
Within specification limits there are many possibilities of improvement in speed, workability, and freedom from rejects.
This PLUS factor is worth considering. We'd like to tell you more about it.
The Varnish Products Co.
Cleveland, Ohio

For a real good polishing job use
KEYSTONE EMERY
TURKISH — NAXOS — AMERICAN
KEYSTONE EMERY MILLS *Write for Sample* 4316 Paul St., Phila., Pa.